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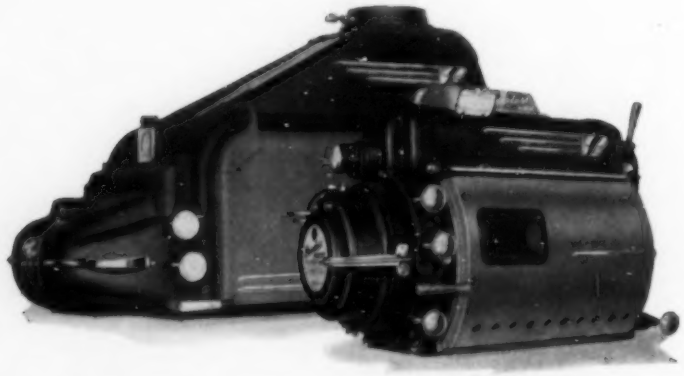

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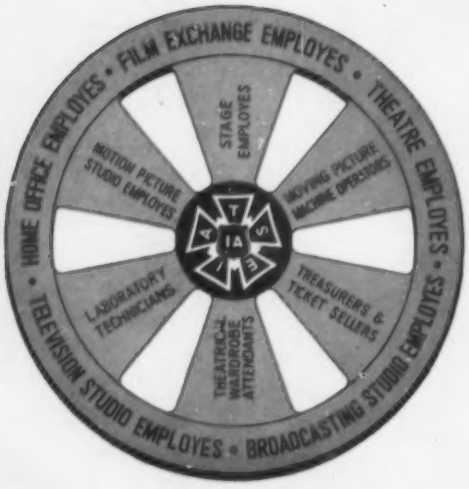

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INTERNATIONAL PROJECTIONIST

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Monthly Chat

Looking Backward Over the Past Year

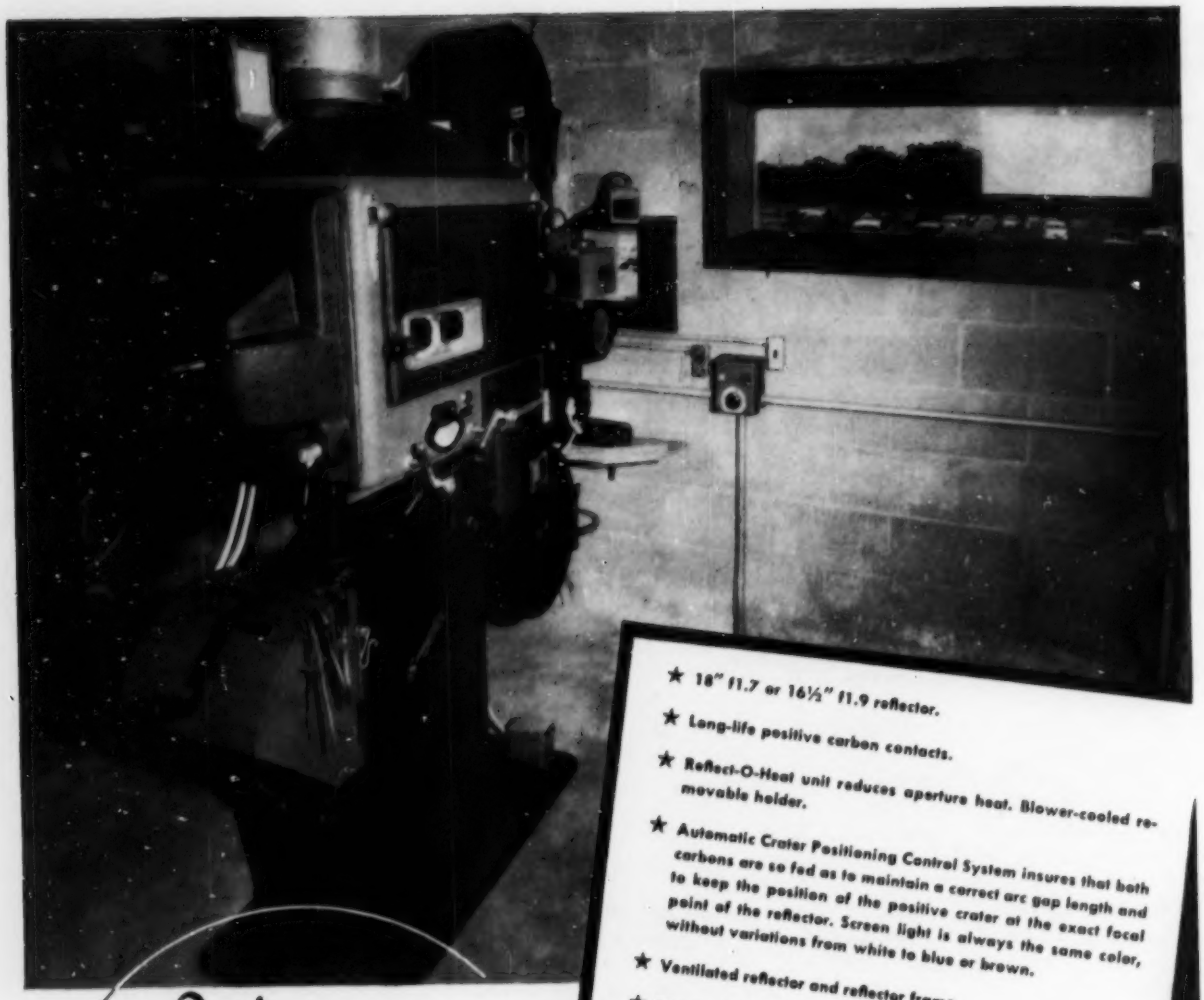
WITH THE HOLIDAY season here, it is an excellent time to take look backward over the events of the past year in the motion picture exhibition industry. Last January IP stated that 1954 was the year when the industry stopped bemoaning its forthcoming doom in the battle with the Tv interests. It became aware that the technological weapons it had put into use were attracting people back into theatres and renewing the health of the business. The continuing rapid growth of the drive-in section of the industry was also a great help. The year now closing, 1955, was one in which further gains were made, and one in which future patterns were apparent.

The important news this year was "roadshow" presentation of special expensively-budgeted films such as the Todd-AO production of "Oklahoma" and the double-frame VistaVision showings of "Strategic Air Command." 20th Century-Fox also entered the roadshow picture and will shortly arrange for presentation of 55-mm CinemaScope prints in some large theatres. The new projection equipment developed for these "roadshows" makes use of a film frame more than twice the normal 35-mm size plus stereosound reproduction of great range and fidelity. The results in realism and beauty of both picture and sound are such that the Tv boys can only stand aside and watch. The 35-mm prints of these "big" pictures will enable smaller theatres to profit.

The Combined Magnetic-Optical Print

A FEW MONTHS ago it was stated in this column that confusion among projectionists over the wide variety of release prints either being circulated or scheduled for circulation had reached a point where the whole industry was likely to be hurt. This month we can report that the film producers, working through the Motion Picture Research Council in the development of the combined magnetic-optical print, have taken a step which may relieve much of this confusion and also eliminate the shortage of CinemaScope prints. Often only magnetic prints have been available from exchanges, and a majority of theatres do not have the equipment to play them. An article in this issue of IP describes the magnetic-optical print and how its introduction will affect the projectionists. M-G-M has taken the lead by using the new print for a December release.

However, there are strong objections from 20th Century-Fox and also from many engineers within the film industry. They feel that the narrow optical track squeezed onto this print is not as efficient as the standard optical track long with us. They assert that the use of what they consider to be an inferior soundtrack will be a step backward that contradicts all the effort made during the past few years to improve sound. It is hoped by the many who oppose use of the narrow optical track that the effort by equipment manufacturers to make single-channel magnetic sound systems available at the lowest possible price will encourage many exhibitors to forsake optical sound reproduction of CinemaScope.



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VOLUME XXX DECEMBER 1955 NUMBER 12

Color and Its Reproduction on Film

By ROBERT A. MITCHELL

The tremendously important role which natural color now plays in the production of motion pictures makes this series of articles particularly timely. They describe the nature of color and various methods used to reproduce it in the film theatre.

COLOR is a mighty important aspect of present-day movie production. Even television is turning more and more to natural color. Now, nearly everyone knows what color is, but no one, not even Noah Webster, has succeeded in defining it satisfactorily. We can only describe color as a special kind of visual sensation caused by the predominance of certain wavelengths of light and the absence of others.

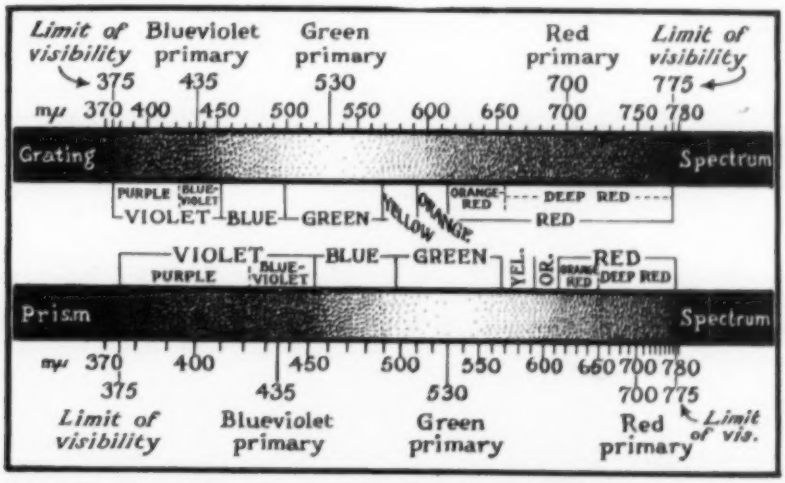

FIG. 1. The visible spectrum as produced by a diffraction grating (above) and a glass prism (below). A grating spectrum is "normal," that is, equal differences in wavelength are separated by equal distances. In a prism spectrum the violet wavelengths are spread out by greater dispersion, and the red wavelengths are much compressed. The most easily discernible spectrum colors are violet, blue, green, and red. The narrow yellow and orange bands between the green and the red are too dulled to be immediately apparent.

A narrow beam of white light, such as that from the sun or a carbon arc, can be broken up into a long band of brilliant colors, called a *spectrum*, by either a diffraction grating or a glass prism. Production of a spectrum by such means proves that ordinary white light is actually a mixture of colored rays, each ray having a specific wavelength.

The appearance of a spectrum depends upon whether a grating or a prism was used to produce it. In a prism spectrum, the longer wavelengths are squeezed together and the shorter wavelengths are spread out. A grating spectrum is "normal," that is, equal wavelength differences are separated by equal intervals along the spectrum (Fig. 1).

Four principal bands of color can at once be perceived in any complete spectrum: violet, blue, green, and red. The violet rays have the shortest wavelengths of all, and the red rays have the longest. The entire range of visible wavelengths is included between 370 and 780 millimicrons (mu). A millimicron is only 0.000000039 of an inch!

Close inspection of a spectrum re-

veals narrow bands of yellow and orange between the broad green and red bands. But because the brightest part of an equal-energy spectrum is the green region, the spectral yellows and oranges are so dull by comparison that their true color is not immediately apparent. A famous astronomer once complained that he could see no yellow in the spectrum.

It was discovered a long time ago that all the colors of the spectrum, and many more besides, can be matched by combining the light taken from three very carefully selected regions of the spectrum. The three fundamental spectral hues, called *primary colors*, are blueviolet (435 mu), green (530 mu), and red (700 mu).

This significant discovery led to an interesting explanation of human color perception. The eye has three "color receptors," each seeing only a portion of the spectrum. The blueviolet receptor sees all wavelengths from the violet end of the spectrum down through the blue to the middle of the green band. The green receptor perceives all wavelengths from the far end of the blue band down to the middle of the red band. The red receptor sees all wavelengths from the middle of the green band down to the red end of the spectrum.

The "ideal" visual response of the three color receptors of the human eye is plotted in Fig. 2. Note the curious "red hump" in the extreme violet region. The presence of this hump indicates that the shortest visible wavelengths stimulate the red receptor to a small degree as well as the blueviolet receptor. Red stimulation in this region accounts for the definitely purplish cast of the extreme violet.

Primary Color Sources

It is not necessary to use a spectroscope as a source of primary-color rays. Properly selected fluorescent lamps or glow tubes of the neon-sign variety may be used, or ordinary incandescent lamps fitted with narrow-band color filters to screen off all but the desired rays. Mercury-vapor tubes fitted with the proper filters are used as sources of monochromatic blueviolet (436 mu) and yellowish green light (546 mu). Primary green 530 mu) is unfortunately absent from the spectrum of the mercury-vapor lamp, but the 546-mu "line" is close enough for many purposes.

The production of colors by combining blueviolet, green, and red lights on a screen is called *additive color formation*. Illustrated by Fig. 3, this method is superior to all others for the accurate reproduction of desired colors. Observe that the combination of all three primaries in equivalent amounts produces pure white. The combination of only two primaries in equivalent intensities results in a *reciprocal hue*. Each of the three reciprocal hues (lemon, magenta, and cyan) is "complementary" to the primary hue absent from its composition. For this reason lemon is sometimes called "minus-blueviolet," magenta "minus-green," and cyan "minus-red."

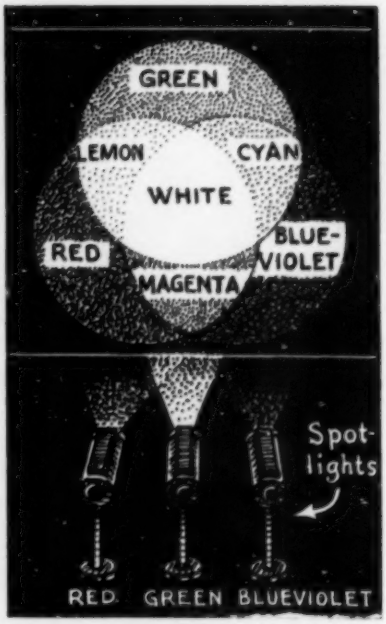

FIG. 3. Additive color formation. Blueviolet, green, and red lights may be combined to reproduce any desired color. Pure white is produced by combining the three "primary hues" in equivalent intensities. If three spots of B, G, and R light are thrown upon a screen, as in this picture, cyan (bright greenish blue) is produced where the green and blueviolet spots overlap, lemon (bright greenish yellow) where the green and red spots overlap, and magenta (dazzling purplish rose) where the red and blueviolet spots overlap. Magenta is called a "non-spectral purple" because it does not occur in the spectrum. Lemon, magenta, and cyan are the complementaries of the primary colors, and are known as the three "reciprocal hues." They are important in the printing of natural-color films.

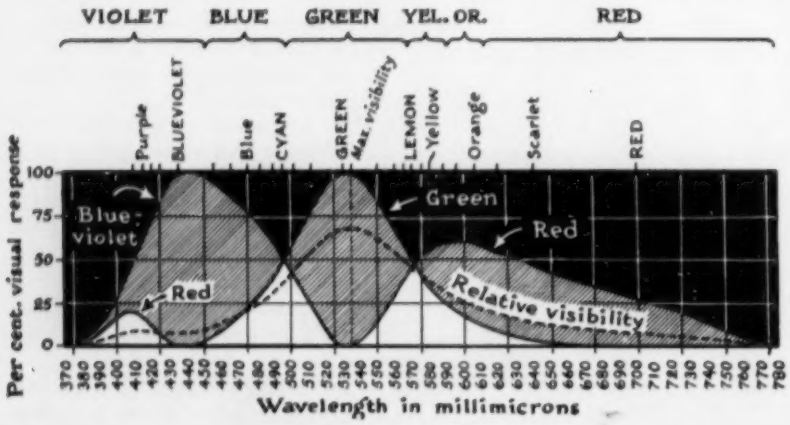

FIG. 2. "Ideal" normal response of the three color receptors of the human eye to the visible wavelengths of the equal-energy spectrum. The eye actually perceives only three colors, blueviolet, green, and red. Other spectrum colors are produced where the three main color regions overlap. The blues, for example, are mixtures of blueviolet and green, and the yellows and oranges are mixtures of green and red. The red receptor of the eye is stimulated, not only by red rays, but also to a small degree by the extreme violet rays. The shortest visible wavelengths, as a result, appear definitely purplish. The brightest part of the equal-energy spectrum (maximum visibility) lies in the yellow-green region very close to primary green. Being relatively less bright, the yellow portion of the spectrum has a dull olive color, and the orange region looks rather brownish.

Now, the composition of any color may be specified by a set of three numbers, one for each primary. The conventional order of the "indices" of a "trichromatic specification" is easy to remember because it is alphabetical — B, G, R.

On the basis of this new system, pure white is designated by 100-100-100. This color specification signifies an additive combination of blueviolet at 100 per cent intensity, green at 100%, and red at 100%. Black, the complete absence of light, is 0-0-0. A medium gray is expressed by 25-25-25, indicating that the B, G, and R components each has a relative value of 25% intensity. Flesh-tint is 40-50-80, purple is 100-0-20, medium brown

. . . as the shadows lengthened across the field, State threw into high the drive that's destined to linger long in football memory . . .

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is 0-5-15, jade-green is 40-100-40, etc.

The six fundamental hues — the three primaries and the three reciprocals — are so important in the technology of color motion pictures that descriptive data on them is especially interesting.

The Fundamental Hues

BLUEVIOLET, 100-0-0. Deep bluish violet at normal levels of illumination, intense blue at very high levels. Wavelength less than 440 mu, standard 435 mu. Relative brightness, 0.07 (white = 1). Complementary: lemon.

GREEN, 0-100-0. Bright rich green. Wavelength 530 mu. Relative brightness, 0.68. Complementary: magenta.

RED, 0-0-100. Intense deep red. Wavelength greater than 670 mu, standard 700 mu. Relative brightness, 0.25. Complementary: cyan.

LEMON, 0-100-100. Bright slightly greenish yellow. Wavelength, 570 mu. Relative brightness, 0.93. Complementary: blueviolet.

MAGENTA, 100-0-100. Dazzling purplish rose. No wavelength, does not occur in spectrum. Relative brightness, 0.32. Complementary: green.

CYAN, 100-100-0. Bright greenish blue. Wavelength, 495 mu. Relative brightness, 0.75. Complementary: red.

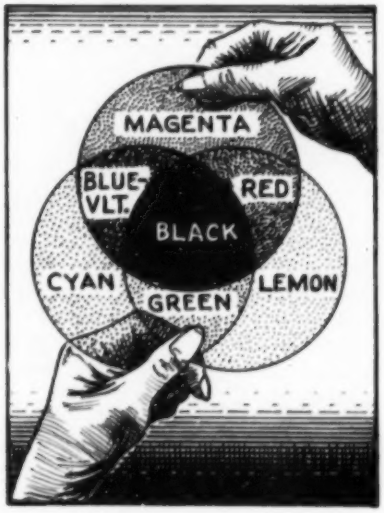

FIG. 4. Subtractive color formation. Three reciprocal-hue color filters are placed together and overlapped in this picture. Where all three overlap, no light can get through, hence the result is black. Where the magenta and lemon filters overlap, red, a primary hue, is produced. (Magenta passes blueviolet and red, lemon passes green and red. Because the magenta filter blocks the green, and the lemon filter blocks the blueviolet, only red rays can pass through both. In other words, green and blueviolet are subtracted from white light by the filter combination, leaving only red.) The other two primaries, green and blueviolet, are produced similarly by the reciprocal filters. The primary hues are utilized in natural-color photography.

Subtractive color formation involves combinations of the reciprocal hues in the form of pigmented materials, not colored lights. This process is utilized whenever paints, dyes, or other colored substances are mixed. It is best illustrated by the superposition of lemon, magenta, and cyan color filters in front of a white screen, as in Fig. 4. Observe that the combination of all three filters absorbs all light producing black. This is exactly the reverse of combining the three primaries on a screen to produce white.

The subtractive combination of two reciprocal-hue filters results in the production of a primary hue. White light, so far as human color vision is concerned, ordinarily consists of three primary components, B, G, and R, in equal intensities. Each reciprocal filter absorbs one primary component and transmits two. But when two such filters are placed together, only that primary which is transmitted by each can pass through both filters. Of the two blocked primaries, one is absorbed by one reciprocal filter, and the other is absorbed by the other filter.

Confusion in Description

Painters and printers work with the reciprocals as "subtractive primaries," a rather confusing term that has led many people to assume wrongly that lemon, magenta, and cyan are primary colors. These hues are actually the complementaries of the primaries, blueviolet, green, and red. Further confusion has resulted from the common practice of calling lemon "process yellow," magenta "process red," and cyan "process blue."

Human color vision is additive, not subtractive, in its functioning. An orange object, for example, absorbs all of the blueviolet component of white light and about ¾ of the green, thus reflecting to our eyes about ¼ of the green and all of the red component. The additive combination of green at 25% relative intensity and red at 100% is orange (0-25-100).

The complementary of any color can be determined by subtracting its trichromatic specification from 100-100-100 (white). Standard medium blue, for example, has the specification

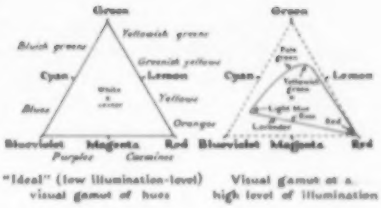

FIG. 5. It is often convenient to specify color mixture by means of a triangular diagram, the three corners of which are marked by the three primaries. The three reciprocals then occur at the midpoints of the three sides of the triangle. Hueless white, a mixture of all three primaries in equivalent intensities, occurs at the exact center. The "chromaticity triangle" holds for color mixtures only when the colors are observed at low levels of illumination by an ideal observer. When light level is increased, the blueviolet primary looks brighter and bluer (less violet), and the green primary looks yellower and paler.

100-30-0. Its complementary, therefore, is:

100 - 100 - 100 White
— — —
100 - 30 - 0 Medium blue

0 - 70 - 100 Rich yellow

Any pair of complementary colors (e.g. blue and deep yellow) combine additively, as when projected upon a screen, to form pure white.

100 - 30 - 0 Medium blue
\+ + +
0 - 70 - 100 Rich yellow

100 - 100 - 100 White

Subtractive combinations of complementary pairs by combining color filters, on the other hand, results in black in only three cases — the three primary-reciprocal pairs. In *subtractive* color-forming calculations, corresponding indices are multiplied, *not* subtracted.

0 - 0 - 100 Red
× × ×
100 - 100 - 0 Cyan

0 - 0 - 0 Black

The subtractive process gives a low value of a primary color, not black, in the case of all other complementary pairs of hues.

100 - 30 - 0 Medium blue
× × ×
0 - 70 - 100 Rich yellow

0 - 21 - 0 Dark green*

A special type of subtractive color-

*The number 21 for the resultant green index is obtained by multiplying 30 by 70%, or 0.70.

forming process occurs when paints and similar pigmented materials are mixed. Called "reversed color addition," the calculation is a bit complex, and may be dismissed with the practical observation that neither black nor neutral gray can be obtained by mixing paints of complementary colors unless the pair be one of the three primary-reciprocal pairs (blueviolet & lemon, green & magenta, red & cyan).

Human Range of Vision

The trichromatic theory of human color vision accounts for all the observed facts, and is probably true even though biologists have yet to discover three separate color receptors in the optic nerves and cones. The three response curves plotted in Fig. 2, however, are "ideal," and are approximated in actual color viewing only when the spectrum is observed at low levels of illumination.

At high light levels each receptor is stimulated to some extent by all three primaries. The three curves in Fig. 2 then spread out at the base of the chart, the blueviolet and red curves actually overlapping in the green region. The green of an excessively bright spectrum accordingly looks yellower and paler than normal. Spreading of the green "toe" into the blueviolet region causes the violet to become bluer and, at the extreme violet

FIG. 7. The clear white area in this spectrogram shows the transmission curve of an ideal blueviolet filter. A filter having these characteristics passes blueviolet light and blocks green and red light. The solid line reveals the transmission characteristics of a certain very good commercial color filter. Note how closely it follows the ideal curve. The broken line indicates the transmission of a less satisfactory gelatin filter.

end of the spectrum where we find the "red hump," rather grayish — a sort of silvery lavender-blue. The greenish blues become definitely whitened under high brightness-level conditions of viewing.

The gamut of hues and their chromatic intensity, or "saturation," may be plotted on an equilateral triangle, the corners of which represent the pure primary hues. The "chromaticity triangle," of which more will be said later in connection with color photography and picture reproduction, is shown in Fig. 5. Note that a line drawn between any two colors complementary to each other passes through the center of the triangle — the "white," or "hueless," center.

At high light levels, however, the chromaticity triangle degenerates into the lop-sided curve shown at the right in Fig. 5. It can be seen that all hues except primary red (the most intense red imaginable) have lost saturation, or become washed out, by leaving the sides of the original triangle and working in toward the hueless center.

Limitations of System

The *degenerated* triangle reveals a sad fact. It is impossible to match, by means of primary-light combinations, all the hues of the spectrum at excessively high levels of illumination! There is no definite point at the top of the degenerated triangle where primary green may be located. This is

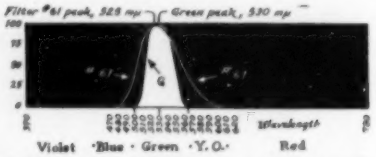

FIG. 8. An ideal primary-green filter transmits only a narrow band in the green region. The solid line shows the transmission characteristics of a good green gelatin filter. Although it "peaks" properly, the commercial filter transmits too much of the blue, and especially of the yellow wavelengths, to be entirely satisfactory in such exacting applications as comparison colorimetry and the copying of color motion-picture films.

because excessively bright green light stimulates, not only the green receptor of the eye, but also to some extent the blueviolet and red receptors. Primary green then virtually "contains" more red than do the blues of the spectrum even at the highest light levels, hence the pure spectral blues cannot then be precisely duplicated by mixing green and blueviolet on a screen.

This defect of the trichromatic system of both additive and subtractive color formation, although a nuisance in the scientific measurement of color, is not sufficiently serious to annoy color-photography technologists.

Industry Practice

To standardize and simplify working procedures, many color engineers today use the ideal, or non-degenerated, chromaticity triangle as a basis for color determination in place of the older "standard observer" tables and other complicated and arbitrary colorimetric standards established by scientific organizations many years ago.

If we ignore the saturation-destroy-

(Continued on page 42)

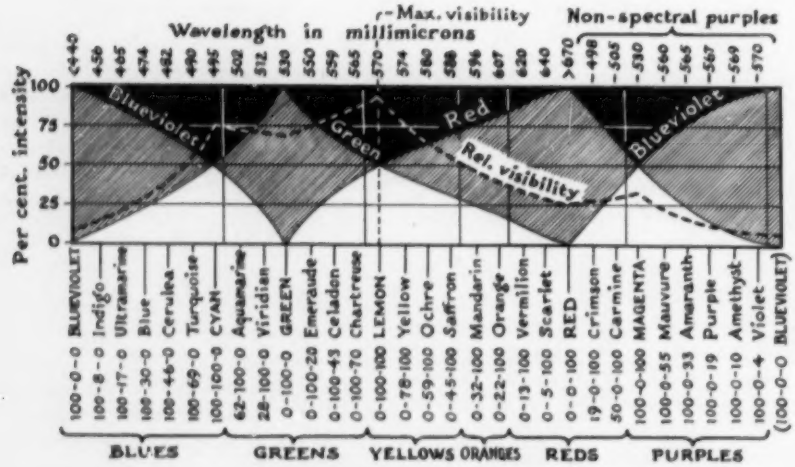

FIG. 6. Reproduction of the full gamut or range of hues by additive combination of blueviolet, green, and red illuminants. The thirty hues are listed in approximately equal sensation-difference steps along the bottom of the chart. The color-specification numbers refer to the relative intensities of the primary components in this order: B, G, R. The non-spectral purples are composed of blueviolet and red, and are assigned the wavelengths of their complementary blue-greens, greens, and yellow-greens. The curves in this chart look very different from the eye-sensitivity curves in the spectrum chart (Fig. 2). While the brightest wavelength in the equal-energy spectrum is 535 millimicrons and has the specification 0-100-1 (almost indistinguishable from primary green), the brightest hue made by additive mixture of the primaries is lemon (0-100-100), a bright greenish yellow which matches the spectrum wavelength 570 millimicrons.

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and thereby reestablishing the motion
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There's No Business Like Show Business!

The Combined Magnetic-Optical Print: A Compromise to End Confusion

By JAMES MORRIS

Despite complaints that this move is a step backward, M-G-M releases combined print to end bottleneck created by the refusal of many exhibitors to install magnetic sound equipment.

AFTER a lengthy period of struggle, it seemed likely this month that a permanent, or at least a semi-permanent, compromise is about to be reached in the battle of the soundheads. On the 23rd of December, M-G-M is releasing a film called "Kismet," the prints of which will carry both magnetic and optical soundtracks so that a single print may be played in any theatre regardless of what type of sound reproduction equipment the theatre possesses.

Although there are many valid objections to this type of print, raised both by 20th-Century-Fox and many reputable sound engineers, it must be admitted that the magnetic-optical print goes a long way toward solving one of the industry's most vexing problems—the confusion arising from the existence of a variety of release prints requiring different projection room equipment. The biggest drawback in the eyes of its opponents is that the optical track on this print is considered to compromise sound quality. Greater realism in both picture and sound was the elusive goal sought after by the men who revolutionized the whole technique of exhibition a few years ago.

Many Studios Joined

A number of studios in addition to M-G-M participated in the design of the magnetic-optical print although these studios have not as yet begun to produce them in their laboratories. They include Columbia, Universal and Warner Brothers. All of these producing interests felt that the cost of continually producing two different types of CinemaScope prints—magnetic for some theatres and optical for others—was too much to bear.

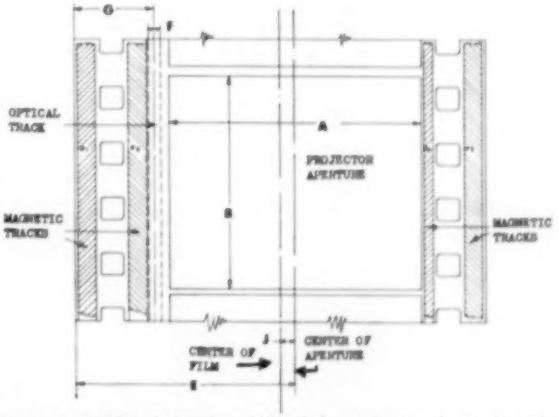
In addition, these companies have been complaining loudly for some time that distributing both magnetic and optical prints created distribution problems that were almost impossible to solve in practice. All theatres cannot use magnetic prints, and those requiring the optical type are often required to wait for playing time while magnetic prints lay unused at exchanges.

20th Century-Fox, on the other hand, has been strongly opposed to the whole idea of the combined print, and has stated repeatedly that the only progressive solution for the confusion resulting from the distribution of two types of prints would be for all theatres to install some form of magnetic sound. If a theatre is too small or not ready for a full magnetic stereosound system, Spyros Skouras, president of Fox, told exhibitors assembled at the recent Allied States convention in Chicago, the thing to do is to purchase sufficient magnetic reproduction equipment to play one magnetic track over the theatre's existing amplifier and speaker. The necessary equipment, he told the exhibitors, costs less than $900 and is now available from all manufacturers of theatre sound equipment.

Picture Size Reduced

Another objection by 20th Century-Fox concerning the magnetic-optical print is that the extra space required to hold the optical sound track cuts into the size of the CinemaScope picture, reducing the width from an aspect ratio of 2.55 to 1 down to about 2.35 to 1. M-G-M executives consider this an impractical outlook, remarking that most theatres using CinemaScope magnetic prints have to mask down their apertures anyway because the physical limitations of their prosceniums and auditoriums make it impossible to show 'Scope pictures in the full 2.55 to 1 ratio. In addition, it is pointed out that optical-sound CinemaScope prints have a 2.35 to 1 aspect ratio anyway. The new magnetic-optical print has the same dimensions and requires no change in lenses.

The Fox stand on the sound question is supported by many engineers within the industry. They feel that the introduction of magnetic stereophonic sound was an important and necessary step forward, and that en-



The position and size of the picture aperture and the narrow optical soundtrack of the combined magnetic-optical print is shown in the above diagram prepared by the Motion Picture Research Council. Shaded areas indicate the position of the four magnetic soundtracks. Dimension A is 0.839 inch maximum; B is 0.715 inch maximum; E is 0.738 inch plus or minus 0.002 inch; F is 0.038 inch maximum; G is 0.262 inch plus or minus 0.002 inch, and J is 0.049 inch. At 0.038 inch (F) the width of the optical track on this print is less than half the 0.084 inch width of the standard optical track.

couraging exhibitors not only to retain their old optical sound reproducing setups, but also giving them a more narrow, less efficient optical soundtrack, squeezed onto a 35-mm print that already carries four magnetic soundtracks, is a step backward. They point out that the optical track on the new combined print will give less satisfactory results than the standard optical soundtrack which the industry is trying to replace.

M-G-M technical spokesmen deny this. They admit that there is a slight unfavorable change on the signal-to-noise ratio of the narrower optical track, but they claim that this can be effectively compensated for by increasing the fader setting in the projection room by 4 to 6 decibels. They also state that there is no decrease in sound frequency range when the narrow optical track is used compared with the wider standard variety. They add, however, that they consider magnetic sound superior to any form of optical reproduction now available.

Paramount Studios, it is interesting to note, is the only large studio not affected by the introduction of the magnetic-optical print. Since it has stubbornly refused to go along either with the CinemaScope or magnetic sound ideas, its prints can be run in any projector, with or without changes.

Advantage Is Economic

It is understood that the chief reason for developing the combined magnetic-optical print was an economic one. It was designed to solve distribution problems and to cut costs. It should not be assumed, however, that this print will solve all reproduction problems without any changes in a theatre's projection setup, or without any extra precautions on the part of the projectionists.

As described in last month's issue of IP, the new print utilizes the narrow "Foxhole" type of sprocket hole needed to conserve space on CinemaScope magnetic sound prints. In order to exhibit this print, an optical sound theatre must install new projector sprockets to conform to the dimensions of the CinemaScope perforations. It must also "degauss" or demagnetize its projection and rewind equipment so that the magnetic tracks on the print will not be damaged while in the theatre.

The Altec Service Co. has issued a special bulletin to its nationwide staff dealing with these problems. While stressing the moderate expense of the changes needed (new projector sprockets might cost from $75 to $100), Altec suggests the following procedure:

1. Careful alignment of the sound slit in the optical soundhead because of the reduction in soundtrack width.

2. Special attention to demagnetization in houses where only optical sound is used to eliminate the possibility of the magnetic tracks picking up extraneous noise as the film leaves the upper magazine, passes through the projector head, and travels through the optical head to the lower magazine. Failure to follow this procedure may cause trouble with a perfect print if it is intended for further use in magnetic reproduction.

3. The installation of new "Foxhole" CinemaScope sprockets in both projector and soundhead.

Altec also pointed out the possibility of an increase in signal-to-noise

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Lester B. Isaac
NATIONAL DIRECTOR OF EXHIBITION FOR CINERAMA

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ratio because of the reduction in the width of the optical soundtrack.

To Magnetic Houses First

It should be mentioned here that M-G-M, and presumably the other producing companies which will use the magnetic-optical print, are aware of the danger of damage to these prints if they are distributed to theatres accustomed only to optical sound reproduction. The plan is to distribute them to magnetic-equipped houses for first runs. It is felt that this plan will work out because it is believed that just about all first-run theatres are equipped to handle magnetic sound.

A number of producing companies in addition to M-G-M participated in the design of the magnetic-optical print. The experimental work was carried out by the Motion Picture Research Council in Hollywood. The original plan had been to devise a means of wiping off the magnetic stripings on CinemaScope prints after all theatres equipped for their use had run the film. An optical track which existed all along beneath the magnetic striping would have then been used by the smaller theatres. This idea didn't work out, and a print on which a narrow optical track was placed beside the number 2 magnetic track was designed instead.

Three courses are open to any theatre in deciding what type of sound reproduction is desired from the combined magnetic-optical print provided the required equipment is available at the theatre. Reproduction from all of the three stereophonic magnetic tracks, plus the track for surround effects, can be obtained exactly as heretofore. Reproduction of only the number 2 magnetic track is suggested by 20th Century-Fox and many sound engineers as the next best expedient. Equipment to accomplish this can be purchased from most theatre equipment dealers for less than $900. Less desirable from the standpoint of sound quality, but also least expensive, is the course of reproducing the narrow optical track. The projector sprockets necessary for using film with CinemaScope perforations can be purchased for $100 or less.

The second course, that of using single-channel magnetic sound, will be interesting to projectionists at many small theatres because it offers an opportunity to provide patrons with high quality sound at low cost. Typical of the single-channel magnetic sound systems now available are the Simplex units distributed by National Theatre Supply. A description follows:

Priced to sell at less than $900, the Simplex XLI01 single-track magnetic sound system utilizes the same components found in the largest Simplex full stereophonic system. Magnetic soundheads are equipped with standard multi-track plug-in pick-up heads, even though only the number 2 track is reproduced. The soundhead fits any standard projector mechanism and accommodates all standard upper magazines.

Two plug-in pre-amplifiers come as standard equipment with this sound system. They are mounted in a small wall-type cabinet and are instantly interchangeable or replaceable. Use of 2 pre-amplifiers permits individual sound level balance from both soundheads.

The power supply is housed in a ventilated wall cabinet designed to increase the life of the unit and cut down tube replacement. It is self-regulating and equipped with selenium rectifiers and dual rectifier tubes for continuous operation. Constant load level is automatically maintained.

Sound changeover is made by means of push button control. Changeover cabinets are mounted on the front wall at each projector location and a bullseye "ON" light indicates the projector in use. This method of changeover is adaptable to any number of projectors.

The Simplex single-track magnetic system is designed to provide for greatest possible economy, while at the same time permitting the use of standard components that are not replaced or discarded should the system be expanded to full stereophonic sound at a later date.

In conclusion it should be emphasized that the magnetic-optical print was developed, not because it offers any improvement in theatre sound quality, but because a majority of the nation's exhibitors were unwilling to install magnetic sound in their theatres. It is a compromise to reduce confusion in the industry.

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Season's Greetings

NATIONAL CARBON COMPANY

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NEW YORK

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RCA Reproduces Pictures by Magnetic Tape System

New equipment, now being field tested, may alter Tv methods through low-cost recording and reproduction of pictures and sound on magnetic tape.

An RCA engineer examines complicated magnetic reproduction equipment at New York City's NBC studios. This still experimental reproducer transmits color Tv picture signals, eliminating the need for an actual picture on film.

AN INTRICATE electronic system for recording color and black-and-white pictures on magnetic tape for Tv use is now being field tested by the NBC studios in New York City.

The system was developed by RCA and was first publicly demonstrated on Dec. 1, 1953 at the RCA Research Center, Princeton, N. J. A full report of the demonstration was carried in IP's Dec. issue of that year. Today, exactly two years later, laboratory refinements have improved the system almost to the point where it may soon be put to general commercial use.

When the time comes that it is actually put on the market, "electronic photography" as it is referred to by the originators, will probably revolutionize the entire motion picture and television industry. The new system is nothing more, nor less, than the recording of sound *and* picture on a special magnetic tape that can be stored, replayed immediately without processing, or "erased" and used again.

Widespread Use Foreseen

Though the field testing now being conducted by NBC is strictly for television purposes, the same principles may some day apply to the recording and exhibiting of motion pictures for theatres. In addition to television and motion picture use, the new type tape recorder is adaptable to home entertainment, education, and industry in general. Television tape recorder units are certain to be developed in the future. These will enable a Tv set owner to accumulate a library of favorite television programs which can be seen whenever desired, in the same way that a library of phonograph records now makes it possible to hear favorite records at will.

Following the 1953 demonstration, an improved television tape recorder was developed by RCA and then installed in the NBC studios for field testing. Earlier this year, a color television program using the new equipment was transmitted over commercial Tv net work facilities for the first time. The telecast, complete on magnetic tape, was sent via closed circuit from New York to St. Paul, Minn., as part of the dedication ceremonies of the new research center of the Minnesota Mining and Mfg. Co. Minnesota Mining is the manufacturer of the new magnetic tape.

The entire program was recorded in advance on the developmental video tape system at the NBC studios, and the tape was stored until scheduled transmission time. The telecast was received by St. Paul over the microwave relay facilities used for NBC commercial network programs.

How System Operates

The Tv magnetic recorder is similar in its basic principles to the conventional tape recorders used today for sound alone. Electrical signals — broadcast video and audio signals of television — are impressed through a recording head onto the magnetically treated surface of the plastic tape. As the tape is drawn across the recording head, the head continuously changes the magnetic polarity of the magnetic particles on the tape so that they become a compact code of the original signal. This pattern remains indefinitely on the tape during subsequent playbacks, until it is desired to "erase" the signals electronically and use the tape again to receive another set of signals.

For playback, the tape is drawn across the same head or a similar one. The magnetic code on the tape causes an alternating current to flow in the windings around the reproducing head, creating a duplicate of the original signal.

One of the chief differences between sound tape recording and Tv tape recording is the volume of signals each carries. While sound tape recorders must accommodate signals in a frequency range of up to 20,000 cycles per second, the video signals of black-and-white television extend up to 4,000,000 cycles per second. With the addition of color, at least

(Continued on page 42)

Season's Greetings

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Portable Arclamp Equipment For 16-mm Projection†

Arclamps make it possible to use greatly enlarged screens for 16-mm shows, and also permit projection in rooms that cannot be entirely darkened. Various lamps and associated rectifying units are described in the following article.

By ROBERT S. FREEMAN
Strong Electric Corp., Toledo, Ohio

WITH the use of 16-mm projection equipment for the showing of motion pictures to large audiences, the need for increased light is becoming more apparent.

That it is possible to show 16-mm pictures to a large audience was demonstrated by the premiere of a new educational film in Madison Square Garden in New York City. A full color film was projected more than 250 feet onto a screen 32 feet wide in the main arena of the Garden.

When the size of the audience exceeds 200 people a screen larger than 8 or 9 feet wide should be used. An incandescent lamp will not furnish enough light for this size of screen and an arc lamp should be used.

1600 Lumens Obtainable

Portable 16-mm 30-amp arc projectors are capable of projecting 1600 lumens onto the screen using a two-interruption shutter with approximately 70% center-to-side screen distribution. This is approximately five times the amount of light obtained with a 1000-watt incandescent lamp.

† Journal of the SMPTE, June 1955.

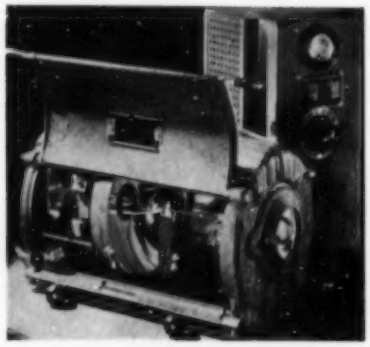

Fig. 1. 30-amp reflector-type arclamp used on the Amproarc 20, GPL PB 101, and Holmes Nuarc, Rexarc, and television rear projector.

An arclamp which projects 1600 lumens on the screen will allow a picture 15 feet wide to be used on a matte-surface screen and provide 9 Foot-Lamberts when measured at the center. A 15-foot wide screen is large enough for an audience of approximately 575 people.

The larger semiportable 16-mm 46-amp arc projectors are capable of producing 2500 lumens on the screen, with the shutter running. With 2500 lumens available a picture 18½ feet wide can be used with a brightness of 9 Foot-Lamberts on a matte-surface screen. This is large enough for an audience of over 1000 people.

Basically there are three carbon arcs which are used for 16-mm projection. These are the 10-amp, 30-amp, and the 46-amp arcs.

Types of Portable Arclamp

PORTABLE 10-AMP AND 30-AMP ARCS: The 10-amp arc is a relatively new carbon-arc trim available on the RCA Porto-Arc projector when special feed and take-up facilities are provided. The carbons used are a 6.4-mm carbon for the positive and a 5-mm carbon for the negative. These carbons will allow a continuous showing of a 4000-foot reel of film which takes approximately 2¼ hours.

The 10-amp trim will project 850 lumens on the screen at 70% center-to-side screen distribution using a two-interruption shutter. This is over twice the amount of light obtained with a 1000-watt incandescent bulb.

The power supply which is used with this carbon trim provides 10 amps DC at 50 volts. Two 6-amp gas-filled rectifier tubes are used. Primary tap switches are provided for varying line voltages.

The 30-amp 28-volt DC arc uses a 6-mm x 8½ inch positive carbon and a 5½-mm x 6 inch negative carbon. These carbons are sold under the National Carbon Co. trade name of Pearlex. With the lamp operating at rated voltage and current, the burning rates of the carbons are 6¼ in./hr for the positive carbon and 3⅝ in./hr for the negative carbon. This will allow the continuous showing of a 2000-foot reel which takes approximately 1 hour.

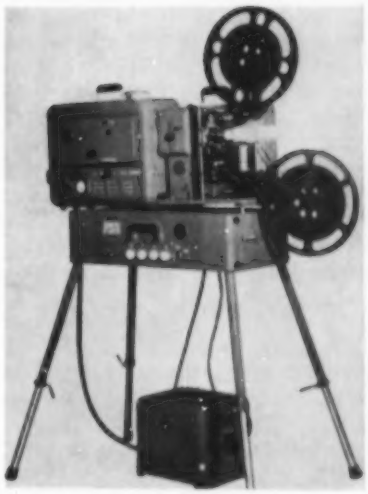

Fig. 2. Reflector-condenser type arclamp as used on the RCA Porto-Arc projector.

Reflectors, Condensers

There are two types of lamphouses used with the 10- and 30-amp arcs. They are the reflector type and the reflector-condenser type. Figures 1 and 2 show these lamphouses.

The reflector type of arclamp is used on the Amproarc 20 projector, the General Precision Laboratory Model PB101 projector, and on the Holmes Nuarc, Rexarc and Television Rear Projector.

This arclamp uses an elliptical reflector 10¼ inches in diameter with a geometric focus of 4 inches. The working distance of the reflector is 16 inches from the film aperture which results in an optical speed of *f*/1.6. This matches the *f*/1.6 lens commonly used in 16-mm projectors.

The reflector-condenser type of arc lamp is used on the RCA Porto-Arc projector and on the Victor 1600 projector. This arc lamp uses an elliptical reflector 7½ inches in diameter at a working distance of from 24 to 25 inches. The condenser lens is mounted 13 inches from the reflector and the combination of the reflector

and condenser lens results in a working distance of less than 17 inches. This will give an optical speed of approximately *f*/1.6.

Some of the features which can be found on the lamphouses for portable projectors are horizontal and vertical adjustments for the reflector, focus adjustments for the reflector, adjustable-speed motor for carbon feed, arc imager and an ammeter to read the arc current.

All the projectors require heat filters or aperture cooling when black-and-white film is used unless it is of a rather low density. Usually the heat filter is not required when showing color film. At silent speed (16 frames/sec) the heat filter is required for all film.

30-Amp Power Supply

Power supplies for the 30-amp arc are two-tube, gas-filled, full-wave rectifiers. They operate off a 115-volt line and have line adjustment taps for voltage variations. The AC load does not exceed the 15-amp limit provided for by most 115-volt convenience outlets. AC volt-meters are provided on the rectifiers to check the line voltage. All the lamp-houses have an interlock switch which operates a contactor to remove power from the arc whenever the lamphouse door is opened.

SEMIPORTABLE 46-AMP ARCS: A 46-amp 33-volt DC arc lamp is used on the General Precision Laboratory Model PB102 projector and on the Eastman Model 25 projector. These projectors are semiportable. However, they are extensively used where a permanent installation is desired. Figures 3 and 4 show these lamps mounted on projectors.

The carbon trims used in these lamps are a 7-mm x 12-inch Suprex positive carbon and a 6-mm x 9-inch Orotip C negative carbon. These carbons will give a full 80 minutes of burn at 44 to 46 amp and 33 volts DC.

The reflector used in the lamp is 11⅜ inches in diameter with a geometric focus at 4 inches and a working distance at 30 inches.

The lamp used on the GPL Model PB102 projector has a plano-convex lens of approximately 15-inches focal length placed 3⅝ inches from the film aperture. This allows the reflector to work at 25½ inches with a beam speed at the aperture of *f*/1.6. The plano-convex lens acts also as a heat filter. In addition to the heat filter the GPL Model PB102 uses a pulsed air blast on the film aperture to cool the film and reduce film buckle.

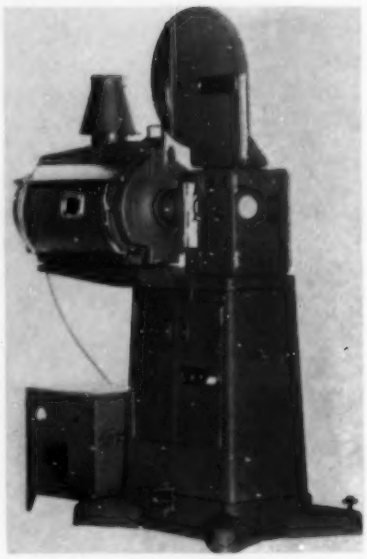

Fig. 3. 46-amp arclamp used on GPL model PB 102.

A condenser-lens system is also used with the Eastman lamp. The condenser lens which is used on the projector with a tungsten lamp, is replaced by a condenser lens of 44-mm (1.73 inches) diameter designed for use with the arc lamp. A heat filter 5 inches in diameter is mounted directly in front of the lamphouse. The heat filter is required for black-and-white film but is not required for color film. To reduce film buckle a curved gate of 3-inch radius is used. This slight curvature of the film gives it strength to withstand the distorting forces produced by the heat on the film.

The 46-amp arclamp is capable of supplying 2000 to 2500 lumens on the screen depending upon whether or not a heat filter is used.

The rectifier for this lamp is a 230-volt, 4-tube Tungar rectifier. The current drawn on the primary side of the transformer at rated output voltage and current is 13 amps. Power to the arc may be adjusted by an 8-position rotary-dial switch. An interlock switch is provided on the lamphouse door which operates a mercury relay to control the AC power input

(Continued on page 41)

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Season's Greetings

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1945 to 1955: Ten Years of Progress In Projection Technology

In addition to widely-heralded developments in wide-screen projection, stereophonic sound and slow-burning triacetate film, the last ten years have seen a number of little-publicized but important improvements in projection methods.

THE PAST ten years have witnessed a number of important developments in 35-mm film projection, and also in the complicated photographic and electrical processes that go into producing a finished motion picture release print. A few of these developments, such as 3-D and CinemaScope, are immediately recognized by the movie-going public, hence possess direct box-office value.

Other innovations, such as the reduction of ground noise by magnetic recording, the reduction of negative-emulsion grain by the VistaVision process, and the improvement of image resolution in color prints by the use of multilayer dye-coupler color positives, are holding satisfaction with theatre motion pictures at high levels by virtue of their influence on visual and sound *quality*.

Another important development, the substitution of safety film for the dangerous nitrate film of yesteryear, is of greater significance to projectionists than to the general public. The average projectionist has never had a film fire in his projection room, but he knows of cases where brother projectionists have been seriously injured, or even killed, by accidents with nitrate film.

All theatre-release prints were made on nitrate-base stock until 1946, when triacetate safety base began to be produced on a large scale. The fireproof construction of projection rooms and projection equipment is a sufficient reminder of the days when movie projection was classed among the more hazardous occupations. Projectors and projection rooms are still equipped with such safety devices as were considered necessary for nitrate-film projection.

Unfortunately, the use of nitrate prints has never been outlawed. For this reason, every possible safeguard against film fire still must be installed and kept in good working order. Sooner or later, however, nitrate prints will be a thing of the past, and the projectionist will find himself less likely to be injured by fire than any other theatrical employee.

Safety Film Advantages

The prevalent belief that triacetate safety film presents a fire hazard, albeit a small one, is wrong. Safety film is technically "slow-burning" insofar as it is physically possible to ignite a strip of it and keep it burning by guarding the feeble flame against drafts which would extinguish it. But to maintain the combustion of a large roll of safety film is extremely difficult without some other source of flame.

To burn up a reel of triacetate film in the closed magazine of a projector is presumably impossible. The writer does not know of a single case where anybody, by design or otherwise, has succeeded in burning more than a couple of inches of safety film in a motion-picture projector.

When the first theatre releases on triacetate-base film appeared, many projectionists were made aware of the difference in film stock by the failure of film splices to hold together. This was especially true when "sneak tests" of the new safety film were conducted in 1946. Alternate reels of certain feature films were printed on the new safety film, and no one took the trouble to tell the projectionist that his regular cement was unsuitable for splicing the new stock. A few "shorts" were also issued on safety-base stock in 1946. These sent wise projectionists hurrying to the nearest drug store for glacial acetic acid, a corrosive and pungent liquid capable of joining triacetate film, especially when a little chloroform was added.

In 1947 came the first regular safety-film releases in the form of Republic's "duplitized" (double-coated) Trucolor productions. The new safety-film prints arrived at theatres unaccompanied by either adequate film cements or instructions for splicing. In the meantime, however, manufacturers of film cements were quietly switching over to different splicing ingredients, but that was no help to projectionists who possessed large quantities of nitrate-film cement. The use of an unfamiliar type of film base was bad enough, and the double-coated color film only made matters worse.

This was the severest test to which the new safety film could have been subjected; surprisingly, it emerged victorious. Examination of used Trucolor prints by film technologists revealed that the new safety base did not become brittle or shrink like nitrate film, and that it withstood wear and tear remarkably well.

New Film Cements Necessary

Years of experience with nitrate film have accustomed projectionists to strong splices quickly made. Nitrate base is readily attacked by a large number of rather common organic solvents which may be used either singly or in combination in film-joining fluids. Nearly all of the commercial nitrate-film cements contained a large proportion of acetone; most contained small amounts of amyl acetate (banana oil), ethyl acetate, or some similar compound; the cheaper cements were composed mainly of alcohol and ether, ingredients which work well only in combination, and all were thickened to the viscosity of thin

MELE KALIKIMAKA
(MERRY CHRISTMAS)
HAUOLI MAKAHIKI HOU
(HAPPY NEW YEAR)
LOCAL 665 HONOLULU • HAWAII

syrup by dissolved nitrate base or celluloid.

Note that nitrate cements were composed of inexpensive and relatively non-poisonous ingredients. Their "setting" action was swift, seldom requiring more than 4 or 5 seconds for a perfect splice. Triacetate safety-film base, on the other hand, is resistant to the action of the common nitrate-base solvents. Safety film may be spliced with glacial acetic acid to which a small amount of chloroform has been added, but this pungent mixture is so corrosive to the metal parts of splicing blocks that it is intensely disliked by projectionists.

The best solvent for triacetate base which is not too poisonous to be used in the projection room is a colorless liquid of faint, ethereal odor known as "dioxane." All good safety-film cements contain 50% or more dioxane by volume, the remainder being methyl acetate, acetone, alcohol, or some compatible solvent. Solvents such as methylene chloride, ethylene chloride, and especially tetrachloroethane, are too toxic to be used with safety in film cements.

It is noteworthy that the effective triacetate-film cements—the ones containing 50% or more of dioxane, and no chloroform, which does not dissolve nitrate base—are also satisfactory for splicing the older kinds of safety film and nitrate film. Such cements are accordingly "all-purpose" cements, and are recommended for all types of motion-picture film, excepting certain non-cellulose films now being tested in theatres but not yet in general use.

Focusing Difficulties

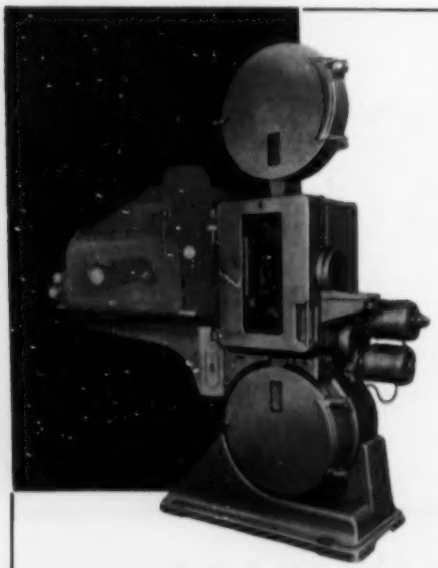
No sooner had triacetate safety film bowed in the theatre field than numerous complaints of focus difficulties emanated from projectionists. The new film base was blamed in nearly every case.

Investigation revealed that the rigidity of safety film was somewhat inferior to that of nitrate film, and that stresses and strains deform triacetate film more readily. This was, and to some extent still is, especially true when the film is subjected to the heat of the projector gate and arclamp beam. Although nitrate film becomes very brittle when heated, safety film buckles and warps out of shape to a greater extent, particularly if simultaneously subjected to mechanical stress.

Recent improvements in the triacetate base, however, have resulted in a safety film which is practically equal to nitrate film in rigidity and tear-strength, and certainly superior to nitrate film in aging characteristics. Triacetate safety film does not become so brittle with age and repeated use, it does not shrink nearly as much as nitrate film, it withstands wear better when cold, and, unlike nitrate film, it never disintegrates spontaneously.

Practically all the credit for the development and commercial production of a successful safety-film base must go to Eastman Kodak Co. The task was far more formidable than most people realize, for it was known at the outset that any new safety film must be far superior to the old diacetate and aceto-propionate safety films to win acceptance in the 35-mm field. Thanks to Eastman, film is now not only *safe* but also *permanent*. Nitrate film literally rots (and sometimes spontaneously explodes) after 40 to 60 years of storage. Triacetate film will likely endure for a millennium; and precious negatives need never be lost beyond recall.

Even though some of the difficulties in focusing safety film must be attributed to failure of the film to lay flat over the aperture, it is definitely known that much of the trouble was caused by inefficient printing and by the use of duplicate negatives printed from shrunken master positives. Certain re-issued pictures, it was discovered, were printed from dupes made from old re-



Holiday Greetings

from

PHILIPS

To projectionists everywhere go our warmest greetings coupled with the hope for a continuance of the friendly relationship begun with the introduction of the Philips 35- and 70-mm all-purpose projector used in the Todd-AO production of Rodgers & Hammerstein's "Oklahoma!"

PHILIPS — ***the finest in motion-picture projection equipment.***

Represented by:

NORTH AMERICAN PHILIPS CO., INC.
100 East 42nd Street
New York 17, N. Y.

PHILIPS

lease positives, the original dupes and masters having been damaged or lost. The use of old sprocket step printers inherited from the days of silent pictures, and speeded up to meet release schedules, has been the cause of jumpy, as well as blurry, pictures. Safety film cannot be blamed for inept lab work.

Film Shrinkage and Sprockets

An increase in the diameter of the intermittent sprocket for longer print life with less tearing of the film perforations has been made possible by the low degree of shrinkage of triacetate safety film. Fresh film stock is perforated with a "pitch" of 0.187 inch (that is, the pulldown edges of two consecutive sprocket holes are 0.187 inch apart). If film did not shrink at all, a 16-tooth sprocket 0.952 inch in diameter would fit the perforations perfectly at all times.

Nitrate film, however, shrinks up to 1.6% after many projections, or when stored for a long period of time in warm, dry air. This extreme degree of shrinkage necessitates a sprocket-diameter of 0.937 inch to enable the teeth to correspond with the spacing of the perforations. In order to accommodate badly shrunken nitrate film, therefore, the diameter of the intermittent sprocket was standardized at 0.935 inch. Now, even though this size of sprocket saves the perforations of shrunken films from being torn away, it definitely weakens the perforations of unshrunken and slightly shrunken films because pulldown is effected by only one sprocket tooth at each side of the film.

Triacetate safety film is not known to shrink more than about 0.5%. This amount of shrinkage is accommodated by a 0.948-inch sprocket. But to permit the showing of moderately shrunken nitrate films without unduly damaging the sprocket holes, projector manufacturers have adopted 0.940-inch and 0.943-inch intermittent sprockets, the latter size being presently favored in America. With the complete disappearance of nitrate films, however, the size of the intermittent sprocket may be increased to 0.945 or 0.946 of an inch for more effective engagement of the film perforations and longer print life.

Projectionists are well aware of the tearing sound caused by the tendency of shrunken films to stick to the sprocket, a noise somewhat similiar to that produced by worn sprocket teeth. The larger the sprocket and the more badly shrunken the film, the worse the noise. This noise should not unduly alarm the projectionist if it be known that the sprocket teeth are in good condition, for damage to the perforations results only in the case of films that are severely shrunken.

It is interesting to note that the large-size intermittent sprockets have better wearing qualities than the old 0.935-inch sprockets. The teeth of the smaller sprockets wear off at the base; and the resulting notch or hook prevents the film from leaving the sprocket freely. The teeth of the larger sprockets wear much more evenly, usually without the formation of notches. Even when worn out, the larger intermittent sprockets are much less likely to roughen or tear the pulldown edges of the film perforations.

Progress in Color Films

Another worthwhile development which took place with the introduction of safety film was the use for the first time of standard positive, or projection, perforations for Technicolor and duplitized color prints. Negative, or camera, perforations having bowed sides were previously used for color-print stock to facilitate the best possible registration of the several superposed colored images—three in the case of Technicolor prints, two (one on each side of the film) in the case of the old duplitized type of color print.

Now, negative perforations are not too satisfactory for projection purposes because they have a tendency to check and crack at the corners. Prints punched with camera-type sprocket holes are comparatively short-lived for this reason. New sprocket teeth and registration pins designed for positive perforations made it possible to effect good color registration on standard print stock. Positive perforations are rectangular in shape, but have smoothly rounded corners which offer no weak points where tears may easily start.

The problem of fitting out color-film printers for positive film perforations

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Wooden Base Shifter for CinemaScope

By JULIUS RALPH

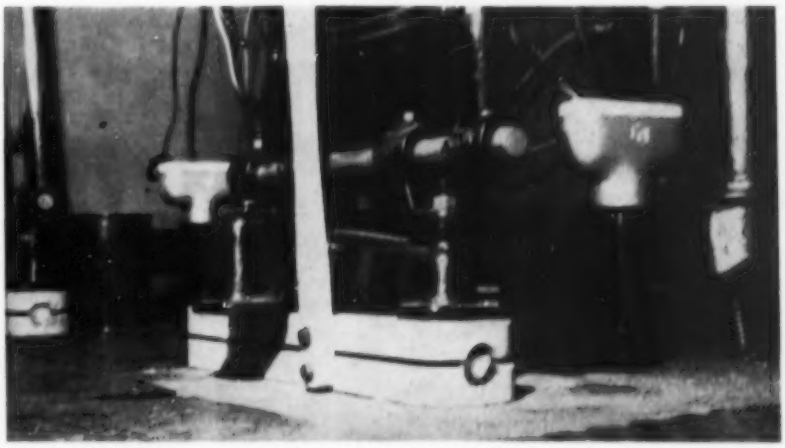
Member, Local 266, Jamestown, N. Y.

ALTHOUGH there are a variety of devices now in use for shifting a projector base for the transition between so-called "standard" projection and CinemaScope, I believe that the two I built for the projectors at the Palace Theatre in Jamestown, N. Y., are as simple and effective as any. Except for one steel ball and some screws, only hardwood is needed to construct these base shifters.

A look at the accompanying illustration is the quickest way to learn how my base shifter works. Shown is the rear of an old Simplex 5-point base resting on the shifter. Upper and lower sections of the shifter are grooved to receive half of the hard-wood dowel which can be seen protruding slightly at the right. This dowel, which is joined to the bottom section of the shifter by screws, acts as a slide bearing when the lever in the foreground is pulled and the projector inched into the proper position to fill either the CinemaScope or standard masking area of the screen.

Of course, the two front points or "legs" of the base must also move slightly when the position of the rear changes. This problem is solved in the following manner: One of the front legs acts as a pivot. It is supported by two 4-inch-square hardwood blocks of the same thickness as the illustrated portion of the shifter. This section pivots on a large countersunk steel ball inserted between the blocks.

The other front leg changes position slightly. Two more 4-inch hardwood blocks separated by a short dowel slide bearing support this leg in such a way that it can move slightly as the position of the rear of the projector is altered by means of the lever.



Wooden shifting device under old Simplex base.

was considered a tough one by film technologists. A Technicolor printer, for example, is amazingly precise in its action. It is able to transfer colored dye images from three separate "matrix" printing films and place them in exact superposition on the gelatine-coated print stock. The sprocket teeth and pins of the device must fit the film perforations exactly. The various films run through the printer very taut; and the machine unfailingly maintains exact positioning of all the several films involved in the printing process.

Shortly before triacetate safety film came into use, Ansco produced a new type of color film for both negatives and projection positives. Known as Ansco Color, the new film was similar to the Agfacolor multilayer dye-coupler film manufactured in Germany. The remarkable thing about this type of color film is that it is wholly photographic and requires no special cameras, printers, or processing equipment. It can be used in ordinary motion picture cameras, developed like black-and-white film, and printed on regular printers. The color is built into the emulsion of the film by the manufacturer.

The only drawback of dye-coupler color film is the high cost of making it. All manufacturers of motion-picture raw stock now make this type of color film; and its popularity attests to its simple processing, wide photographic latitude, high image-resolving power, excellent color reproduction, and, of course, its freedom from color registration difficulties.

Even before Ansco Color positives entered the theatre field, Ektachrome and other Eastman Kodak color negatives of the dye-coupler type had gained widespread acceptance for filming in natural color even when the release prints were prepared by the relatively inexpensive dye-imbibition process. Formerly, all Technicolor pictures were photographed with special 3-strip color cameras which produced black-and-white negatives containing the color values in latent form. Dye-coupler color negative used in ordinary cameras has gradually displaced the bulky and complicated Technicolor camera.

Industry acceptance of Ansco Color positive film for release printing was quickly followed by the appearance of Eastman Color print film, which supplemented the already popular family of Eastman dye-coupler color negatives.

(Continued on page 38)

from
American Optical Company
creator of the
Todd-AO System

Telephone Co. Goes Magnetic

The sound reproduction methods used by the Telephone Company to announce the time of day to dialers strangely parallel changes in sound reproduction methods for motion picture exhibition.

In the first method, employed by the Bell System in the early 1920's, a single telephone operator announced the correct time, as read from a regulated clock, into a network extending to each central office in a city.

Shortly afterward, the Audichron Co. of Atlanta, Ga., developed an automatic time announcement machine based on optical sound-on-film operation. More recently, the Audichron Co. completed the development of a new machine using magnetic recording. The magnetic recording medium used on the new machine is something called "talking rubber" developed by Bell Laboratories. The machine is said to provide a superior speech quality as well as greater flexibility in use.

GE Postpones Color Tv

The new 22-inch color Tv tube now being developed by General Electric is still more than a year away from actual market distribution. RCA presently is distributing a set priced at $795. G-E's objective is a set that will sell for less than $500.

An "Ideal Theatre" Is Planned For Historic Williamsburg

Two large screens, lighted from a single projection room, will be employed so that the entire audience has a comfortable, undistorted view of the picture.

AN IDEAL theatre in which every seat is a perfect one, is being planned for Williamsburg, Va. As it will work out the theatre will actually be two theatres under a single roof, constructed back-to-back and sharing a common projection room. The dual theatre project is sponsored by a group known as Colonial Williamsburg, Inc., supported by a Rockefeller grant, for the purpose of affording visitors a more realistic sense of life as it was in the early Virginia capital.

To further enhance the 18th century atmosphere of restored "Colonial Williamsburg," it was decided to make use of the latest motion picture production and exhibition techniques. Ben Schlanger, noted theatre architect was brought in to design the proposed ideal theatre. A number of Schlanger's well-known ideas, such as maskless screening, peripheral modulation, and sympathetic surround, will be incorporated in the projection system.

Williamsburg stands as a living symbol of American colonial times. Its historical importance and interest can be measured by the more than half million visitors that come each year to view the hundreds of colonial homes, taverns, shops, and other buildings that have been restored at a cost of about $30,000,000. Guides in authentic colonial dress direct the tourists around the history-laden town.

It is to give these visitors an even more realistic sense of life in this early Virginia capital, that Colonial Williamsburg, Inc. is planning its proposed ideal theatre. The idea is to produce a film picturing life in 18th century Williamsburg that would then be shown to visitors on their arrival. For this non-commercial orientation film to have its most forceful impact —in transporting the audience back in time and place—it was felt that it had to be shown in a distractionless and realism-provoking theatre.

Arthur L. Smith of the sponsoring group outlined the proposed project before the delegates of the recent SMPTE convention at Lake Placid, N. Y. He explained that the aim of the theatre would be to achieve a high degree of participation and realism from the point of view of the audience. Construction would be such that the viewer would be lost in an "optical vacuum," according to Smith. Any distractions, whether actual or psychological, such as architectural forms, projector noise, heads of viewers in front, would be eliminated.

Striving zealously to make their unique project a success, the group called in additional consultants to tackle specific problems. Walter Hicks of Reevesound Co. is the advisor on sound engineering; C. S. Perkins and Edward Seeley of Altec joined the group as sound equipment engineers; and Dr. Leo Beranek of Bolt, Beranek & Newman, took on the task of acoustic design.

A wide-screen participation type of show was decided on, set up in two auditoriums, back to back, sharing a common projection booth. The reason for two small auditoriums, rather than a single larger one, is to insure the perfect location of every seat in the house. Each auditorium will have eight rows of seats, capable of handling 250 people for a half-hour showing of the orientation film. A wide-film process rather than 35-mm will be the method of projection, on a screen or 30 by 60 feet.

However, to achieve the goal of "optical vacuum," it was found necessary to eliminate any comparative dimensional or scale clues in the auditorium. This means that the curved screen will not be masked. Instead the screen image will fade out gradually at all edges.

"The effect," Smith said, "would be much like peering inside a television tube with the small end knocked off."

In discussing the fading of the picture at its edges, which he called

(Continued on page 40)

Greetings and Best Wishes

We welcome this opportunity to extend the Season's greetings to our many friends in the projection craft who, working together with us thru the years, have enabled us to progress in the drive-in theatre industry.

DRIVE-IN THEATRE MANUFACTURING COMPANY
505 West 9 Street Kansas City 5, Mo.

Season's Greetings

from

CLAYTON PRODUCTS COMPANY

3145 Tibbett Avenue New York 63, N. Y.

In The SPOTLIGHT

We extend a heartfelt wish for a joyous Holiday Season to our many friends who have been so gracious and helpful during the past year. We are deeply conscious of our indebtedness to all those who have made our path that much easier by virtue of their many kindnesses and courtesies. To one and all, wherever located throughout the world, we say — —

The Very Best of Everything Now and in the Years to Come

• The merged AFL-CIO held its first convention at the 71st Regimental Armory in New York City the week beginning December 5. George Meany AFL president, was elected president of the AFL-CIO; and William F. Schnitzler, AFL secretary-treasurer, will fill the same post for the merged unions.

IA President Richard F. Walsh was selected one of the top three of 27 vice-presidents of the new labor federation. In addition to Walsh, IA delegates to the convention were Harland Holmden, general secretary-treasurer; Thomas V. Green, Local 21, Newark, N. J.; Michael J. Mungoven, Local 25, Rochester, N. Y.; and Joseph McNabb, Local 154, Seattle, Wash.

• William C. Scanlan, IA representative, was guest of honor at a testimonial dinner given by District No. 3 (New England), at the Hotel Bradford in Boston on December 4. IA President Walsh and Ken Kelley, official of the Massachusetts AFL, were among the principal speakers. Scanlan was presented with a diamond-studded IA pin.

• Chattanooga, Tenn. Local 259 celebrated its 45th anniversary last month at a dinner-dance attended by top IA officials and many prominent civic and industry leaders. Burton Lowry, president of the Local, was master of ceremonies.

• Fred Beard, popular member of Hollywood Local 165 and one of the old standbys on one M-G-M lot in Culver City, is now associated with the Mike Todd organization and is working at the Kling Studio in Hollywood. Beard was a member of Metro's projection crew for the past 20 years, and he has the best wishes of his former co-workers in his new setup.

• IA Locals 223 (Projectionists) and 23 (Stagehands), Providence, R. I., ended a year-long strike against the Strand Theatre in Pawtucket with the signing of a new agreement between the Locals and the New England Theatres, Inc., owners of the struck house. The pact, which was termed "satisfactory" to all concerned, calls for the return to the theatre of *all* of its former crew—four regular projectionists and one relief man, plus one stagehand.

The Locals called a strike October 1954 when two years of negotiations on a new contract ended in a deadlock. They contended that the theatre management sought to reduce both manpower and wages of the projectionists. The theatre was picketed ten hours daily during the entire year of the strike. The new contract includes the maintenance of two-man projection room operation, the most bitterly contested issue in the negotiations.

DO YOU JUST BELONG?

Are you an active member,
The kind that would be missed?
Or are you just contented
That your name is on the list.
Do you attend the meetings
And mingle with the flock?
Or do you stay at home
And criticize and knock?
Do you take an active part
To help the work along?
Or are you satisfied
To only just belong?
Do you ever go to visit
A member who is sick?
Or leave the work to just a few
And talk about the "clique"?
Think this over, member —
You know right from wrong!
Are you an active member?
Or do you just belong?

25-30 CLUB BULLETIN.

• One of our overseas subscribers, Ivan Bailue, from Sydney, Australia, stopped in at the IP office last month while on a trip around the world. He was one of the projectionists at the Variety Theatre in Sydney, where a disastrous

Ivan Bailue, Sydney Australia

fire occurred last year and barely escaped with his life. "After getting out of the theatre alive," he said, "I didn't want to waste any more time. I had been promising myself a trip around the world for some time, and after the fire I decided to take it without further delay."

Bailue and his partner, Jack Lynch, received severe injuries when a fire broke out behind the screen and bellowed across the theatre, with explosive gasses blowing out the front doors in about three minutes. Lynch was hospitalized for many months. Fortunately, the projection room was the least damaged part of the theatre. At the time of the fire one of the projectors held a reel of nitrate film and had sufficient heat penetrated the projection room there probably would have been not only greater physical damage to the theatre but a loss of life among the theatre patrons. As it was, there were not many people in the theatre at the time of the fire due to the fact that it was a holiday and the number of people injured was low.

• Los Angeles Local 150 and the United Artists Theatre Circuit recently concluded a pact covering the Todd-AO road show of "Oklahoma" now playing at the Egyptian and other United Artists theatres in the Local's jurisdiction. The agreement calls for the same number of men as would normally be employed under provisions of standard contracts, but with an increase in the

The Ole Crank Twister

This Month He Belabors Us With His Ideas on Proper Lamp Lubrication

EVER sense Congress killed that trash mail law, my fan mail has been fallin off somthin awful. It used to be that everybody was writen and tryin to get Ole Twisters endorsement for their partickular product because of his acknoleged wisdumb. Yep, fame kin be quite fickel at times. But goin through the mail yestiday, I got a nice letter from a lad down Arkinsaw way. A penny post card it was. An not addressed to OCCUPANT either. It was addressed proper like to the Ole Crank Twister, CHIEF of the Carousal Theatre.

Nice young lad this was. An he asks for advice in respeckful tones about the proper lubrikashun of lamp parts. It appears that he is havin plenty of trouble with stickin of the slidin members of his H-I lamps resultin from the high juice he burns at his drive-in. Weel son, you sure had the right idea in applyin to the Ole Twister with yore problems. Certain other unnamed parties would do well to swaller their false pride an apply to the fountain head of pracktickal projeckshun wisdumb.

For the slidin members of the lamp there is only one proper lubrikant that will not gum an cause stickin. Thats powdered graphite. Powdered graphite aint so popular though because the dratted stuff won't stick to a smooth surface. Sometimes they use colloidal graphite, kerosene and other forms of petroleum to get it to stick. But it dont do much good. An eventual bindup is the sole dividind.

Fortunately—and here I'm givin you the benefit of the Twisters long experience—there is a sticker and carrier for powdered graphite that wont produce no meloncoly results. What do you think that is? Well its water. Water is the ideal carrier and sticker that will leave no trace due to its complete evaporation by heat.

Timid souls will argue that the parts will rust. But a dolt should know that water doesn't cause rust. Its the air in the water. An how can rust take place anyway when the water in the mixture is promptly evaporated? Start out right son by removin every bit of petroleum gum from the rods an bushings. Clean out the bushings with carbon tet. Sand off the rods.

You add just enuff water to yore powdered graphite to make a thin paste. Then you take a lettle brush so you wont get yore lily white hands dirty. With the brush you coat the rods with the mixture. You work the slidin members back and forth to thoroly coat the inside of the bushings. Do this twice a week on a cold lamp an yore stickin problem is past tense.

Across the street at the Bilikin Theatre is a cookoo who prides his self on bein edjacated. He insists on mixin his graphite with something he calls aich-too-oh. Maybe this aich-too-oh is OK also. But men! Lets keep it simple an use tride and true water in yore powdered graphite an avoid complekachuns.

FRANK W. MACDONALD
IA Local 199, Detroit, Michigan

hourly wage rate. Under the terms of the new Todd-AO deal, Local 150 members receive $3.70 per hour—the same scale as for Cinerama showings.

• The 25-30 Club of New York will hold its annual dinner-dance on Sunday, January 8, 1956, at the Hotel Empire, 64th Street and Broadway, New York City. Top entertainment plus many surprises are in store for the guests, and from all indications at hand it promises to be a gala night indeed. Tickets may be purchased from Benjamin Stern, financial-secretary for the Club, 600 West 218 Street, New York 34.

• One of our out-of-town visitors last month was Gaetano A. Buttafarri, representative of Ferrania, color film manufacturers in Milan, Italy. He was anxious to obtain back issues of IP, several of which we were fortunate enough to have on hand.

• Pinch-hitting for an ailing projectionist in a small theatre in Racine, Wis., back in 1905 when he was a lad of 14, is what started Hubert J. Soens, charter member of Racine Local 460, on a career as motion picture projectionist that has lasted 50 years. Born in Racine, November 2, 1891, Soens practically grew up in show business

Hubert J. Soens

and in 1911, and after working several years in various movie houses, he called upon Milwaukee Local 164 to help him organize the theatres in Racine. In 1912 Racine was organized as an auxiliary to Local 164 and Soens is the proud possessor of the first permit issued. Five years later, in 1917, he realized his ambition when the IA chartered Racine Local 460.

An ardent unionist, Soens has served the Local in many official capacities, and is to this day an active worker in union affairs. His union activities plus his regular job as projectionist at the Rialto Theatre keep him pretty busy, but when time permits he indulges in his hobby of boating and fishing. Although he takes great pride in his 50-year career as projectionist, he is extremely proud of the fact that he is a GREAT grandfather at the age of 64.

• A ruling of far-reaching importance was handed down recently by the Pennsylvania state supreme court in the action brought against Local 451, New Castle, Penna., by the owners of the Skyline Drive-In Theatre. The ruling upheld the decision of a local court in Lawrence County, Penna., that refused to issue an injunction against the union officials in an effort to restrain them from picketing the drive-in theatre.

The Skyline had been picketed by members of Local 451 since early last summer when the theatre management discharged one of the two union projectionists and replaced him with a non-union man. Although there has been no written agreement in effect for the past five years, the Local claimed that one of the owners repeatedly told its representatives that such a contract was not necessary because the same conditions would prevail. Local 451 officials contended that an *oral agreement to continue the terms of a written pact was just as binding as the original contract.* Both courts agreed with Local 451, and this ruling is certain to affect other similar cases.

LETTERS TO THE EDITOR

An Australian Outlook

To the Editor of IP:

Thanks for the continued excellence of publication which is a real lifesaver to us maligned projectionists. Your problems in America appear much the same as ours in the new fields of presentation, and your viewpoints are sane and real. This is deeply appreciated.

In this country curved screens, wide screens, CinemaScope, etc., created panic among leading city shows — some of which made two or three changes in sizes and types of screens, a few returning to the orthodox flat screen. Sound levels at the introduction of CinemaScope were loud beyond all reason and nearly killed the new art with many of the public.

I was rather intrigued by Frank MacDonald's humorous "Crank-Twister" effusion in the June issue. The "Dazzel-Lite" shutter being changed to a one-winger forcibly reminded me of a unique experience here some years ago. Our projectors then had the front two blade shutter (made of cardboard). During the newsreel the bright assistant's hand got in the way of the shutter, breaking the flicker blade completely off. The screen result in extra light was amazing, but strangely the flicker, while pronounced, was not as great as one would expect. The machine vibration, however, was terrific. What would have happened had it been the other blade is too horrible to even think about, but we finished the newsreel on one blade.

I am reminded of another innovation which was introduced early in the 1920's, but which I never saw in operation although widely advertised at the time. It was in two forms, but the idea was the same in each case — a two-bladed shutter allowed some light through to the screen during the pull-down period and flicker blade intervals. One type had a semi-transparent material in the blades, while in the other, both blades were of finely perforated material. I believe one was marketed under the name of "More Light" and the other "Extra Lite." I have often wondered if this idea was sound in principle or whether it would reduce the light by giving a grey effect as I have sometimes seen with a slight shutter ghost.

Once again I thank you for your fine publication, which really enables us projectionists to keep up to date with honest sane statements and your candid opinions.

REG. A. STEWART
Wangaratta, Australia

EDITOR'S COMMENT: Perforated shutter blades certainly do revive memories of the old days. We remember the Extra Lite shutters well. Instead of increasing the brightness of the picture, as they were supposed to do, such shutters accomplished nothing beyond fogging the screen with a gray light and a misty travel ghost. The basic idea was definitely "all wet."

We recall a fellow who firmly believed that he could improve the color of his yellowish low-intensity illumination with a shutter having blades of blue spotlight gelatin. With painstaking thoroughness he constructed a metal skeleton shutter to hold the blue gelatin "wings." The shutter actually did whiten the light — and it did something else, too. As might be expected, it embellished the picture with blue travel ghosts!

Whose Screen Is Biggest?

To the Editor of IP:

Since we are now entering the drive-in era in South Africa, could you please give me details regarding the largest outdoor screen in the world, and also of the largest screen in in-door theatres. We have here in South Africa a number of advertisements in newspapers claiming that such and such drive-in or theatre, has the largest screen in the world.

Regarding the taking over of the holdings of the African Consolidated Theatres Ltd. and their subsidiary companies, consisting of some 140 theatres, by the 20th Century-Fox Films Ltd., all these theatres are covered by an agreement with our Union, which agreement has still some five years to go. A strange thing to record, is that the Fox group in South Africa has never signed an agreement with our Union, although they have been approached by us on many occasions in an endeavor to get their operating staff under our banner.

Sincere greetings to your American projectionists, and the assurance that this Union will welcome any correspondence with interested parties in America.

G. D. BURRELL
General Secretary
South African Cinematograph Operators Union, Johannesburg.

EDITOR'S COMMENT: Like Mr. Burrell we find ourselves slightly confused by the fact that a number of large drive-ins are evidently claiming the title of the "largest in the world." A drive-in recently erected near New York City at Bayshore, Long Island, has a plated aluminum screen 121 feet in width and 65 feet high. There are indoor theatres such as the Gaumont in Paris which have used screens over 70 feet in width. The Radio City Music Hall in New York used a screen 70 feet wide for a CinemaScope production. Fine results were recently obtained by the Paramount Theatre in New York with double-frame VistaVision horizontal projectors and a picture about 62 feet in width.

Wage Dividend at Kodak

A wage dividend estimated at $32,175,000 will be shared next March by about 51,000 employees of the Eastman Kodak Co. This dividend is the highest to be paid by the company since the plan began 43 years ago. Eligible persons will receive $30.25 for each $1,000 earned at Kodak during the five years 1951-55.

The wage dividend is voted by the board of directors and is based on the cash dividends declared on the common stock during the year and on individual earnings over a five-year period. It is paid in addition to regular wages and has no effect on wage rates.

EQUIPMENT EXPERTS ANSWER QUESTIONS AT TESMA FORUM

Seated on the dais at the theatre equipment forum during the recent TESMA-Allied convention in Chicago, was the impressive group of projection equipment experts and engineers shown above. Larry Davee, of the Century Projector Corp., standing before the microphone at center, was moderator of the lively discussion where all sorts of questions and complaints from attending exhibitors and projectionists were answered by an expert on the particular phase of projection involved. From left to right, the panel of experts includes: F. W. Keilhack, of the Drive-in Theatre Mfg. Co.; Al Boudouris, of EPRAD; J. W. Johnstone, National Carbon Co.; Arthur Hatch, Strong Electric Corp.; Davee; Ross Snyder, Ampex Corp.; J. F. O'Brien, RCA; J. A. Fetherston, Kollmorgen Optical Corp.; Leonard Satz, Raytone Screen Co., and Fred Aufhauser, Projection Optics.

Motiograph-Trad Theatre-Tv Projector

THE NEW Motiograph-Trad portable Tv projector, model TPM-300, is now available to theatres throughout the country following introductory demonstrations in New York City and at the recent TESMA-TEDA trade show held in Chicago. Motiograph is exclusive distributor of this Tv projection unit which is manufactured by Trad Electronics, of Asbury Park, N.J.

The TPM-300 is a completely self contained mobile projection unit, weighing approximately 420 lbs. It can provide a large screen picture, up to 27 by 36 feet, and is designed to meet conservative equipment budgets. Price per unit is quoted at $3,750, with 90 days delivery.

The Trad projector was shown publicly for the first time at Asbury Park for the Marciano-Moore fight Sept. 24th last. The throw distance used then was 72 feet, casting a clear picture 24 feet high by 32 feet wide. More recently it was exhibited to the trade in the ballroom of the Park Sheraton Hotel in New York and at the TESMA convention in Chicago.

Uses 120-Volt Current

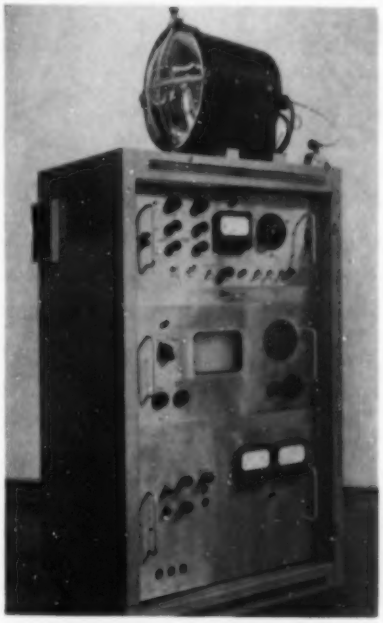
The TPM-300 can be plugged into any 120 volt line in indoor or outdoor theatres, auditoriums, schools, hotel banquet rooms, meeting halls, and the like. A single cabinet console contains complete audio and video systems with power unit, monitor, and all controls. No additional wiring is required, but for off-the-air broadcasts, connection to a suitable antenna has to be made.

An improved Schmidt optical system in an optical barrel is mounted on top of the cabinet. Elevation angle of the optical barrel is adjustable. Variations of the TPM-300 model are the TPM-310 with two Schmidt optical systems located on top of the cabinet and the TPM-320 with two remotely located optical systems. All three of Trad's 300 series can be used for both closed circuit and off-the-air, each set containing a VHF receiver and a UHF adapter.

The TPM-300 model uses a regulated and metered 40 K.V. adjustable high voltage power supply. An exclusive Trad engineering development, known as the Dynamic Contrast Expander circuit, provides far greater light output than previously, and also increases the dynamic range of contrast. A complete audio system includes a 12-watt public address amplifier with multi-match output for use with closed circuit sound or incidental music.

Operation Simple

Operation of the new Trad Tv projector is fairly simple. All controls, video, audio, and synchronizing, are easily accessible at the upper portion of the cabinet. Focus at all contrast ranges is immediately adjustable on the control panel. Each unit is completely fused with overall line power protected by a magnetic circuit breaker for protection and safety.



Motiograph-Trad closed-circuit Tv projector, Model TPM-300

In addition to the control console on rubber tired casters with demountable doors, a complete breakdown of the equipment is as follows: line amplifier and master control, receiver monitor (includes 12-watt audio amplifier), sweep chassis and power supply, A.C. cable, Schmidt type reflective optical barrel, and a full set of tubes, including 5TP4 or 5AZP4.

The technical specifications, taken from the descriptive brochure issued by Motiograph, are as follows:

DIMENSIONS: 53″ by 27″ without barrel.
INPUT POWER: 117 volts, 60 cycle, single phase (can be adapted for different power sources).
VIDEO INPUT: (a) 75 ohm terminated coax jacks; one volt peak negative input level for full brilliance and contrast. (b) 300 ohm balanced line for off-the-air broadcast and presentation.
AUDIO INPUT: (a) 600 ohm balanced line for closed circuit audio. (b) microphone. (c) phonograph, crystal cartridge type. (d) off-the-air broadcast sound. Choice of above inputs completely and instantly available by means of "Function Switch" on control panel.
AUDIO OUTPUT:12-watt push-pull audio system with 3, 8, 15 and 500 ohm outputs.

"Solar Furnace" Resembles Projection Arc Lamp

A recent development in the field of sun power research, known as a "solar furnace," bears a striking resemblance to the arc-lamp operation in motion picture projectors. The solar furnace, of which there are four at the Convair plant of General Dynamics Corp., in San Diego, Calif., is a reflector unit capable of converting sun rays into practical power.

Although the basic principle is similar in both the arc-lamp and solar furnace, the effects of each are definitely opposed. The purpose of the solar furnace is to produce heat instead of light, and it can do this to the degree of 8500 Fahrenheit. As every projectionist knows, the less heat in an arc-lamp, the better.

The solar furnace is actually a special kind of mirror. The mirror face is made of a single piece of polished quarter-inch aluminum formed into a parabolic reflector. A mechanism keeps the mirror slowly turning, so that it always looks straight at the sun. The parabolic shape of the reflector focuses all the sun rays that strike it onto a point the size of a dime.

At a distance of two feet away, the heat of the concentrated sunshine is able to cause a tough metal like tungsten to burn almost immediately. At the same distance a piece of magnesium oxide has been shattered into countless particles.

Research on sun power has already produced such workable items as solar cookstoves, solar house heating equipment, a solar refrigerating plant, and solar water pumps. Two Tv set makers are putting the finishing touches on solar energized Tv receivers. Among the many ideas still in the experimental stage are a solar irrigation project and solar house cooling units.

A solar energized radio receiver may be demonstrated shortly by a midwestern manufacturer. In this design, six or seven light-sensitive silicon cells will be used to charge a battery which in turn will be used to power the receiver. Because the cells presently cost approximately $25 at manufacturer's level, the receiver is expected to be too costly for immediate mass production.

The solar battery may be the most important achievement yet in solar energy. Now being developed by Bell Laboratories, research men point out that at present the solar battery is small

(Continued on page 37)

Rear-Projection CinemaScope Aboard Ocean Liners

Unique adaptation on board U.S.S. Independence and U.S.S. Constitution makes rear projection CinemaScope possible in the ships' theatres.

By NORMAN WASSERMAN

THE PROBLEMS involved in ordinary rear projection have been with us for a long time now, and for the most part they have been satisfactorily solved. Going as far back as 1928, the chain of Trans-Lux theatres have been using Trans-Lux lenses for rear projection with good results. Then along came CinemaScope and with it the problem of converting ordinary rear projection to rear projection CinemaScope. As far as is known, there is no theatre at the present time using rear projection CinemaScope.

There recently arose the further unique problem of installing rear projection CinemaScope on trans-Atlantic ocean liners. The American Export Lines wanted just this kind of installation on board each of its two prize vessels—the *U.S.S. Independence* and *U.S.S. Constitution.*

For more than six months a number of motion picture consultants experimented unsuccessfully in an attempt to install the required CinemaScope rear projection. Finally, Chester Case, head of services and operation for American Export Lines, called in Jack Schaffer, member of IA Local 650, Westchester County, N. Y., who had worked on rear projection projects before.

Presently supervising motion picture installations for distributor Joe Hornstein, Inc., Schaffer visited both the *Independence* and *Constitution* and examined the equipment that was there. Inside of 30 days, including much time spent waiting for the ships to arrive in port, he had rear projection CinemaScope operating without a hitch on both ships.

Why Rear Projection?

The need for rear projection is necessary because of inadequate space for front projection. Inadequate space may result from the architectural design, say of an auditorium, that does not allow for a projection room. Or, a small theatre, wishing to conserve space in the back for seats, might accomplish this through rear projection, deliberately eliminating the projection room. Still another example of inadequate space would be a low ceiling, making it impossible to throw a proper angle of light from the back of the auditorium without interference. As a matter of fact, all these space limitations prevailed on board both the *Independence* and *Constitution*, so that rear projection was the only method of projection possible.

In 1928 Trans-Lux constructed a series of small theatres for newsreel showings. These theatres had no balconies and because of the spatial limitations it was decided to install rear projection. A special Trans-Lux rear projection lens was designed just for that purpose. All this worked out very well until CinemaScope came along.

Since a rear projection lens is still not available for a large CinemaScope picture, Trans-Lux is now constructing projection rooms in the rear of their theatres. These projection rooms are designed to accommodate a CinemaScope picture of approximately 28 feet wide, compared to the previous rear projected picture of only 12 feet wide. Between $30,000 and $50,000 each have been spent in converting Trans-Lux theatres in Philadelphia, Washington, and New York. Jack Schaffer supervised the sound and projection equipment change-over in the converted theatres.

Jack Schaffer, shown removing the Super Panatar anamorphic lens from one of twin projectors now being used for rear projection CinemaScope aboard U.S.S. Independence.

The chief disadvantage of rear-projection CinemaScope concerns the difficulty of adapting it to a large-sized picture. Even with Schaffer's rear projection setup, picture size is limited to 15 feet in width. However, a larger size lens is being designed by the Panavision Co. of Los Angeles.

The difference in operational procedure from the projectionist's point of view is minimal. For rear projection, normal threading and other procedure is followed. The chief difference is that the projectionist will see the image in reverse and he will have to manipulate his controls with the reverse image as his guide.

Trans-Lux Lens

The lens developed by Tran-Lux specifically for rear projection consists of eight elements. Moving from the positive end of the lens, which is nearest the film, toward the negative end, closest to the screen, we find first a pair of dublets, each dublet comprised of two elements cemented together. Next is the prism in the center of the lens dividing the positive and negative elements. As the prism serves to reverse the image, film should be threaded normally. Following the prism are three negative elements that face the screen.

Focal length of the Trans-Lux lens is 28.5-mm, with a ratio of a one-foot wide picture for every 1.305 feet distance to the screen. In the Trans-Lux theatres, however, the adjusted focal lengh was 23.5-min, with a ratio of 1.079 projection distance to a one-foot wide picture.

The Trans-Lux lens barrel is shaped like an elbow, enclosing a 45-degree angle. Therefore, in order for the face of the lens to be parallel to the plane of the screen, the projector holding the lens must be at a compensating 45-degrees. For two projectors, an angle of 90-degrees must be established between them.

When Jack Schaffer was called into consultation on the *Independence-Constitution* CinemaScope problem, it was not the first time he was thrown up against rear-projection sticklers. In 1943 he developed a rear projection setup using a 16-mm projector to secure a 4½ by 6 feet picture on a mock

Tv receiver, with only seven feet separating projector and screen. This was done for the RCA commercial Tv department after engineers had decided it was not practical. With the RCA Service Co., Schaffer then toured the U.S. for eight months demonstrating the potentialities of commercial television on his mock Tv receiver.

Initial experimentation aboard the *Independence*, for only two days at a time whenever the ship docked in New York harbor, was conducted with the aid of a Trans-Lux lens on loan to Schaffer by the manufacturer expressly for this CinemaScope conversion project.

Rear Projection C'Scope

As the focal length of the Trans-Lux lens was a short 28.5mm, it tended to enlarge the image too rapidly to allow it to be picked up completely by the elements of the CinemaScope lens. By removing one of the front elements of the Trans-Lux lens and changing the position of the objective lens in the lens barrel, the focal length of the lens was changed, thereby forming an image small enough so that the CinemaScope lens would capture the complete picture without any distortion.

Special brackets had to be developed to position the anamorphic lens properly. It was found that the only type of anamorphic lens physically capable of fitting this particular job was the Super Panatar variable lens, Model 400, distributed by the Radiant Manufacturing Co. of Chicago.

The constant pounding of the ship at sea was another problem, continuously threatening to throw the entire setup out of alignment. To safeguard against this, all adaptors and brackets were securely doweled and keyed.

The adaptation, as it now stands, makes it possible to show not only CinemaScope, but regular and wide-screen presentations as well, the changeover involving just a simple procedure. The same lens is used in the same position for all three types of presentations. All that is necessary is to hook on the anamorphic lens or else remove it when not in use. Focus is fixed at all times for either CinemaScope, wide-screen or regular projection.

The CinemaScope pictures on the Independence and the Constitution are approximately 12 feet wide. This comparatively small size is due to the restricted space of the auditoriums (150 seats) which includes extremely low ceilings, as well as to the limitations of the lens attachment.

Projectionists operating machines on trans-Atlantic liners whose home port is New York come under the jurisdiction of IA Local 306. Jack Schaffer has been a member of Local 650 for more than 25 years. As former motion picture license examiner of the city of New Rochelle, N. Y., for five years, he once conducted a refresher course in conjunction with Local 650 to help projectionists gain their licenses. Schaffer now feels it is possible to show CinemaScope pictures in any theatre that is equipped with Trans-Lux rear projection lenses, as long as too large an image is not required.

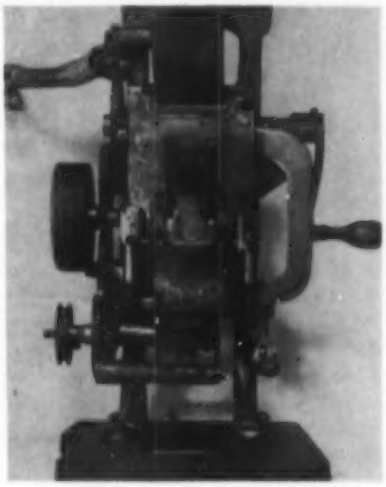
Ray Brian — Historian of Motion Picture Projection

WHEN A MAN earns his living in a field that is also a close hobby to him, he is bound to produce something of note. Ray Brian, business agent of Local 434, Peoria, Ill., is just such a man and IP is proud to bring his contribution to the attention of its readers.

For many years Ray Brian has collected data on every conceivable type of projection equipment. The result by this time is a store of information that probably goes unmatched anywhere in the world. Still not completely satisfied, Brian goes on collecting, and will appreciate any additional item anyone has to offer. Readers having such information are invited to contact Brian through the offices of IP.

Following is a listing of the J's and K's, our sixth installment, of a letter by letter alphabetical rundown containing more than 350 items. With the exception of those items marked here with an asterisk, Brian has photographs of all the projectors named.

JOLY—made in France, 1895.
JOY—made in 1898.*
KALEE—Gaumont-British Co., since 1910.
KAMM—made in England, also known as "Komatograph," since 1910.
KAPLAN—Sam Kaplan, New York City, 1923.
KATHOSCOPE—made about 1900.*
KINETO—made in England, 1915, by Moy.
KINEMATOGRAPH—Joseph Menchen, 1899.*
KINETOSCOPTICON—Chas. H. Oxenham, 1896.
KINAK—. . .*
KINEBLEPOSCOPE—made before 1900.*
KINECLAIR—Eclaire Film Co., 1908.



Geo. Knaak's "Peerless" of 1908.

KINEMACOLOR—Chas. Urban and Geo. A. Smith, 1908.
KINEMATOTHERM—made before 1900.*
KINEOPTOSCOPE—Riley Bros. of York, England, 1896.
KINESETOGRAPH—made about 1900.*
KINESTEROGRAPH—made about 1900.*
KINETOGRAPH—Newman & Guardia, 1896.
KINEVITAGRAPH—made before 1900.*
KINOGRAM—17.5-mm.
KINODROME—Bell & Howell, 1906 to 1914.
KOEHLER—Koehler Optical Co., NYC, 1917.
KOLOGRAPH—Lawrence D. Kohlmeyer, 1914.
KINORA—made by Lumiere's in France, 1912.
KINEOPTICON—Birt Acres, 1896.*
KINEOPTIKON—Joseph Menchen, 1906.
KINOPTICAN—Ernemann, 1930.

Rise in Film Production

On the basis of the number of films already launched during 1955, Hollywood will wind up with its biggest year since 1952. Major studios during the first ten months of 1955 have started 169 films, an increase of 14% over the 148 during the same period last year. Figures for the independent studios show a drop to 45 this year as against 52 last year. A projected estimate for the entire year of 1955 indicates a total of 204 films by major studios, and close to 60 for the indies.

Columbia leads the majors in projects started since January, 1955, with a total of 34, compared to 26 during the first ten months of last year. Paramount is the only major to fall considerably below last year's tally, starting 10 films this year against 16 in 1954.

B & L's 16-mm CinemaScope Lens

A new 16-mm anamorphic projection lens, which combines both prime lens and anamorphic expander, has been marketed by Bausch & Lomb. The lens requires no brackets to support it on the projector and will fit all popular makes.

Setting Up 16-mm CinemaScope Roadshow for Business Film†

Many technical problems were encountered but results on the wide, portable screen justified the effort.

By JERRY FAIRBANKS
Jerry Fairbanks Productions, Los Angeles

INDUSTRIAL leaders are realizing more and more each day that the commercial motion-picture medium, when properly used, can tell the story of their company, organization, or product more effectively than any other existing media. This realization has been aided by the incorporation of every technical advancement in the motion-picture business in order to make the most effective presentation possible.

When Chrysler planned its 1954 dealer meetings to introduce 1955 cars, it was vitally important to them that their new models be presented in the most dramatic manner. First impressions are lasting ones and, therefore, it was very important that the first look dealers would get of this new car be as impressive as possible.

An obvious answer was to take advantage of the latest motion-picture technical advancement, CinemaScope. The screen proportions of this new filming technique are ideally suited for motor cars. The enthusiastic acceptance of this suggestion immediately brought to light the fact that a great many technical problems were going to be encountered in order to present the picture in the most effective and acceptable manner.

First of all, since approximately thirty dealer meetings were anticipated, in already contracted locations, it became obvious that some type of portable 16-mm equipment would have to be used. All these locations were in hotel ballrooms, civic auditoriums, dining rooms, etc., where 35-mm CinemaScope installations were not only nonexistent but impractical as well, in the time allotted and within the budget requirements.

A big problem to be faced was the projection equipment and the screen to be used. The screen had to be readily portable, and yet capable of being set up in a short period of time and giving the maximum screen surface possible.

Large, Portable Screen

The Radiant Screen Corp. of Chicago had just such a screen under development. The largest screen of a really portable nature that could be devised, they felt would give a 21-foot x 8½-foot screen surface. This would be supported by a 24-foot x 10-foot aluminum frame that could be broken down for shipment.

Since so many dealer meetings were to be covered in such a short period of time, it was necessary to plan the travel of these units from most points by airline. Therefore, all the equipment had to conform with the ability of the airlines to handle the units when packed for shipment.

The screen presented the greatest problem. The frame when knocked down and packed represented a package 12 feet in length which was the maximum that would fit into an airliner's baggage compartment. As a matter of fact, it had to be a big airliner at that. Several of the schedules had to be rerouted because nothing smaller than a DC-6 could accommodate the size of the units.

In order to secure the most dramatic presentation of the car it was decided that all events leading up to the first glimpse of the car itself would be filmed in normal screen proportion so that at the appropriate moment the wide screen could be used and the car presented for the first time.

This injected additional problems, not in production, but in the presentation thereof. First of all, a set of portable drapes that could be packed with the screen had to be designed and constructed to work on a traveler that would allow the drapes to reduce the screen area to normal picture size for the first half of the film and then on cue to open to the full width of the screen for the CinemaScope presentation.

Even more intricate was the necessity of devising some method of swinging the anamorphic lens into place on the projection machine at the proper moment in the film. The definition problem being as critical as it is, this device which was developed in our shops had to be built to a very fine tolerance with minute adjustments for centering the picture on the screen as well as lining it up optically with the projection lens it elf.

A projector had to be secured that not only was portable, but that had an arc light source and a physical construction that would allow for the interchange lens mechanism. One projector that satisfied these requirements was the new RCA 400. We therefore immediately placed orders for a sufficient number of these projectors and proceeded with our developments.

Objective Lens Problem

The next problem was the projection lenses themselves which were lacking in uniformity and definition throughout the field. This was a most important point, because all our care in trying to preserve definition could be dissipated by the use of an inferior projection lens. Unfortunately, we were never able to secure a 16-mm lens anywhere combining both a sufficiently high light transmission with flat-field definition at any price. It is

Large-size portable screen for 16-mm CinemaScope roadshows designed by the Radiant Mfg. Co., of Chicago, has an aluminum frame that can be quickly broken down for shipment from one point to another.

†Journal of the SMPTE, Sept., 1955.

surprising that such little attention is paid to such an important factor in the reproduction of 16-mm films. Producing companies use extreme care, and go to great expense, to secure the finest optical equipment for use in the filming, but in reproduction most pictures suffer because of the inferior quality of the lens used, even with high-priced projectors.

Balancing Screen Light

The next problem was the vast difference in screen illumination between the conventional projection on the normal size screen and the swing over to the CinemaScope field which, because of the much greater area to be covered, cut down the screen illumination almost 50%. In order to compensate for this, we provided a neutral-density filter in the projection lens system to be used during the first half of the film in which normal photography was being used. At the cued point in the picture when the swing over to CinemaScope was achieved, the neutral density filter was removed at the same time as the anamorphic lens was swung into place. This gave the same field illumination for both segments of the film.

The use of this medium is most effective and far reaching. Unfortunately, it can only be used for specific, limited showings such as those described here. It is doubtful whether the time will ever come when widescreen 16-mm projection will be available throughout the nontheatrical field. Each application will present its own screening problems, but for effectiveness and an outstanding way to present a product CinemaScope gives the most dramatic and telling results.

OBITUARIES

WILLIAM R. CONSTANS, 56, member of Columbus, Ohio Local 386, died October 24 at the White Cross Hospital in Columbus. A member of the Local since November 1919, he worked in the projection room of the RKO Palace Theatre from the time it opened in 1926 until his death. His wife and daughter survive him.

• • •

MILTON MOON, 58, member of Los Angeles Local 150, suffered a fatal heart attack on November 17. He had been in failing health for the past six years. Moon held membership in the IATSE since 1916, moving to Los Angeles from Sherman, Texas, in 1918.

More and more Drive-Ins are demanding these fine lenses. The Super Snaplites are guaranteed to give you Sharper Pictures, More Light on the Screen, Greater Contrast, and Greater Definition...and this under the most trying outdoor operating conditions. Actually 7 out of 10 new Drive-Ins install Super Snaplite Lenses...and more and more established Drive-Ins are turning to Super Snaplites. Ask for Bulletin No. 222 it gives you complete information on these lenses.

KOLLMORGEN *Optical* CORPORATION

Plant:
347 King St.,
Northampton, Massachusetts

New York Office: 30 Church Street, New York 7, N. Y.

PERSONAL NOTES

DR. RICHARD F. MILLER, has been appointed assistant superintendent of the office of film services at Kodak Park. Dr. Miller has been associated with Eastman Kodak since 1937 when he joined the company as a chemist. Since that time he has moved from supervisor of film base production for aero films to supervisor of quality control in his present department. The office of film services provides Kodak with many technical services having to do with film manufacturing and consumer problems.

* * *

JAMES L. WASSELL has been appointed coordinator of the professional equipment and instrument division of the Bell & Howell Co., Chicago, Ill. Formerly associated with the professional motion picture department of Ansco, Mr. Wassell has also done development work on the adaptation of minature film to the mobile chest X-ray technique. He has been a free-lance cameraman, writer, director and cinematographer of 16-mm films.

* * *

DR. C. E. K. MEES, vice president in charge of research at Eastman Kodak, has announced his retirement. He will continue on as a member of the board of directors while residing permanently in Honolulu, Hawaii. He was with the company for 44 years.

Known world-wide for his work in photographic science and complex color photography, Dr. Mees first came to America from England in 1912 at the request of George Eastman to organize a research laboratory at Kodak Park, Rochester, N. Y. Under his guidance, the laboratories grew to include a synthetic organic chemistry department, a school for aerial photography, as well as a department for the development of photographic apparatus. Among the many achievements of the laboratories are home movies, panchromatic films, and various color processes.

In 1934, Dr. Mees was elected vice-president in charge of all Kodak Research Laboratories. In 1936, he was awarded the progress medal of the

Dr. Cyril J. Staud

Dr. C. E. K. Mees

Society of Motion Picture Engineers. He is the author of 150 publications and holds a fellowship in the Royal Society of London, the highest distinction given to any scientist in the British empire. DR. CYRIL J. STAUD has been named vice-president in charge of research at Kodak, succeeding Dr. Mees. Since joining Kodak in 1924, Dr. Staud has conducted organic research, projects on cellulose and cellulose derivatives, and emulsion research. He played an important role in the company's recent development of faster speed black-and-white films. Dr. Staud is a member of SMPTE and the Photographic Society of America. He has been director of the Kodak research laboratories since 1947.

* * *

FRED P. HORTON has been appointed purchasing agent of the Victor Animatograph Corporation of Davenport, Iowa. Horton previously was a member of the Victor accounting department. The present appointment is part of an expansion program of facilities and services by the Animatograph Corp.

Tax Laws Favor Tv

With heavy holdings in both the motion picture and television fields, Herbert J. Yates, president of Republic Pictures of America, is carefully examining the trends in each industry while going ahead with plans for both.

In explaining the recent rapid strides made by Tv in comparison to the movies, Yates pointed out that Tv is "the only amusement with Government subsidy," its costs being tax deductible as business expense by the giant blue chip corporations which sponsor programs. He also emphasized that theatre film production costs have soared to 150% of what they used to be.

Faster Film Foreseen

Photographic film speeds may increase as much as 100 times in the next 75 years, according to an Eastman Kodak prediction.

Best Holiday Wishes

from Century

to projectionists throughout the world whose effort and skill have helped so much in the task of modernizing projection methods.

Century Projector Corp.
729 Seventh Ave., New York, N. Y.

Season's Greetings

To the Motion Picture Projectionist from the Makers of the

HEYER-SHULTZ ALL METAL REFLECTOR

Heyer-Shultz, Inc. Cedar Grove, N. J.

BOOK REVIEW

CLOSED CIRCUIT DATA BOOK, 1955, by Leonard Spinrad, 511 East 20th St., New York 10, N. Y., 72 *pages*, $10.

Leonard Spinrad's new data book contains a valuable concentration of facts, figures and pertinent comment on the rapidly growing closed-circuit Tv field. Easily readable, the book moves from a general survey to a detailed rundown of the organizations involved in every aspect of closed circuit Tv.

In it can be found a brief history of closed circuit operations, the position of the government, the labor picture including the unions involved, as well as comprehensive directories of equipment manufacturers, service companies, producers of closed circuit shows and a chronological listing of productions from 1936 through June, 1955. The author makes the point that producers now tend to exaggerate their claims, though he foresees for the future a levelling out of such "fuzzy accounting."

Motion Picture Business Will Grow Instead of Decline

Rising incomes and population, along with a shorter work week, longer vacations, and increased travel are some of the trends A. H. Robinson, treasurer of Eastman Kodak Co., foresees during the next 20 years as contributing toward more picture making. This forecast was part of a report issued by Hugh Long & Co. containing predictions for 1975 by American business leaders.

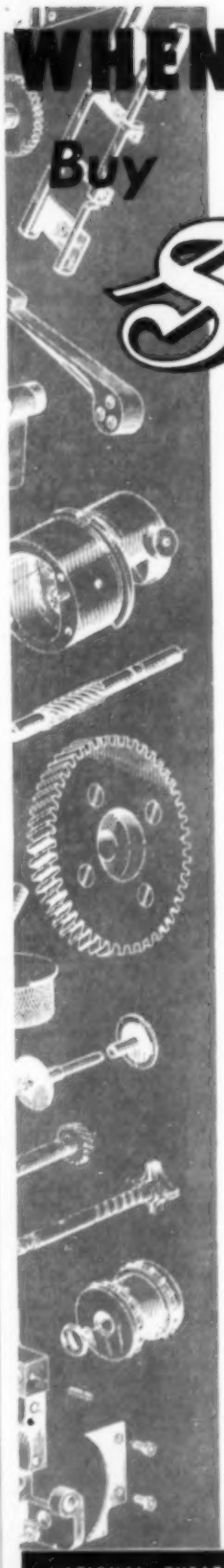
Robinson also foresaw faster film speeds, improved color quality, medical motion picture radiography, and new types of photosensitive materials coming into use.

Composite views of the forecasting group were that the electronics industry in 1975 will represent a $30 to $35 billion business, with automation breaking new ground. Television sets in the U. S. will probably total 92 million, 90% of which will be color receivers.

The industry leaders also predicted that guided robot missiles will range outer space as special television "correspondents," transmitting back to large wall-type home screens Tv pictures of distant planets, and that solar-powered transistor radios will be in widespread use and will last a lifetime.

CinemaScope Lens

A 16-mm Vidoscope anamorphic Lens, designed to reproduce CinemaScope proportions, is now being marketed by the Vidoscope Corp. of New York. The new German made lens may be used interchangeably on any 16-mm camera or projector.



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What Do You Know About Carbons?

The fifth of a series of questions and answers which explain the unique nature of carbon and describe how the substance is utilized so as to provide the brightest of all artificial light sources. Data presented here provided by National Carbon Company.

Why The Condenser Lens?

Application of the high intensity arc to projection through the medium of a condenser lens optical system gave three to four times as much light on the screen as the low intensity arc and further improved the efficiency of light production. Subsequent improvements in the condenser lens system for high intensity lamps raised the efficiency of the optical system to more than five times that obtained from the earliest projection lamps.

Thus improved, these lamps delivered about forty times the amount of light projected on the screens of the first motion picture theatres. This figure, in turn, has been more than doubled by the latest improvements in high intensity carbons and optical systems, making the screen illumination now available ninety times that originally used.

Benefits of the Reflector Lamp

In place of the condenser lens which, in the old type low intensity lamp, picked up a light cone of approximately 45 degrees, the reflector lamp uses an elliptical mirror to pick up more light from the positive crater and focus it on the aperture plate. Both carbons are mounted in a horizontal position with the crater of the positive carbon facing the mirror.

By the adoption of this optical principle the cone of light picked up from the crater was increased from 45 to 120 degrees, and projection efficiency, greatly improved.

The needs of theatres requiring more light than this, but not large enough to require the condenser type high intensity lamps, were met in a similar manner by using the mirror principle with the high intensity arc, in what is commonly termed the "Hi-Low" lamp.

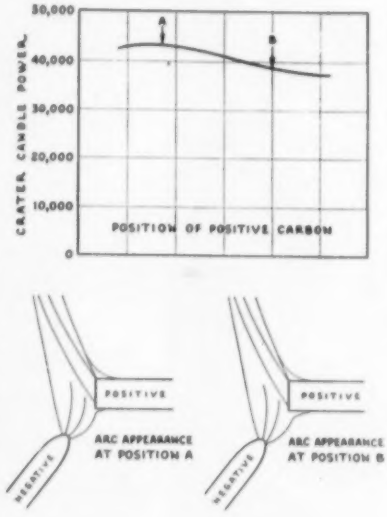
How Does the "High-Low" Lamp Differ From the Condenser Type?

In the "Hi-Low" or reflector high intensity lamp the negative carbon is inclined to the rotating positive, but at a much smaller angle than in the condenser type high intensity lamp. The positive carbon used is 9mm in diameter, and the arc is operated at a current of about 75 amperes, whereas the condenser type lamp uses a 13.6mm positive and an arc current of about 125 amperes or more.

How does carbon position affect light output?

In order to obtain the best results from high intensity carbon arcs particular attention should be paid to the proper position of the positive and negative carbons. The effect on the crater candle power by a variation in the position of the positive carbon with respect to the negative is shown in the accompanying drawing. The arc current is held constant in these tests.

The letters A and B on the curve indicate the values of crater candlepower corresponding to the positions A and B of the carbons illustrated in the sketches



below the curve. At position "A" the bottom edge of the arc flame between the two carbons is located so that its continuation passes through the crater face of the positive carbon. At position "B" the positive carbon has been moved forward so that the flame sweeps underneath it. The arc will burn steadily in either position. However, it is evident from the curves that maximum crater candlepower is obtained with the carbons at position "A". At position "B" the crater candlepower is reduced by as much as 10 per cent.

In most high intensity lamps with rotating positive carbons the negative should be in the same vertical plane as the positive; that is, the carbons should be accurately aligned as viewed from above. Due to the current lead arrangement in some lamps, however, better positive crater formation is obtained by positioning the center line of the negative slightly off the center line of the positive. The lamp manufacturers' instructions for positioning the carbons should be strictly adhered to, because certain lamp characteristics may alter the generally recommended positioning of the carbons.

Operation of the lamp with the positive carbon set ahead of its correct position not only reduces the volume of light but may also result in short carbon life. A protrusion of ⅛ inch beyond the proper setting may decrease the life of the positive carbon as much as 10 per cent.

The use of too short an arc gap may make it impossible to adjust the positive carbon feed to the rate at which the carbon is being consumed. Likewise, if the negative carbon feed is adjusted to feed the negative carbon faster than it is being consumed, the arc will be shortened and the same difficulty encountered.

Can you align a condenser-arc optical system?

Lamp manufacturers specify the distance from the positive carbon crater to the rear condenser lens and the distance from the front condenser to the film aperture, as well as the protrusion of the positive carbon from the contact jaws or flame shield. These distances should be maintained accurately and the positive crater should be accurately aligned with the condensers, film aperture and projection lens.

Some lamp manufacturers supply devices for properly aligning the carbons and optical system. One device employs a dummy condenser and a dummy projection lens, each made of light weight metal to fit the respective holder, and mounted in place of the real lens where alignment is to be checked. This is accomplished by moving the respective elements so that a straight steel rod will pass in turn through the positive carbon contact, the center of the dummy condenser lens, the center of the aperture, and the center of the dummy projection lens. The optical alignment should be checked periodically and always checked after any adjustment of the equipment involving moving of the lamp house or projector head.

Paramount Selling Shorts to Tv

Paramount Pictures is now in the middle of negotiations involving the sale of nearly 2000 short subjects to be used for television. The package deal, said to be worth around $4,500,000, represents practically Paramount's entire library of back-numbered reels, consisting mainly of cartoon, musical, and sports items.

SOLAR FURNACE RESEMBLES PROJECTION ARC LAMP

(Continued from page 29)

and efficiency is low, but the realistic hope is that it will be further improved. The high cost of silicon used in the battery is one of the problems to be faced.

Many scientists are urging all-out solar-energy research on the grounds that the supply of common fuels is declining while the need for power is increasing. They point out that earthly energy sources are limited in quantity and mostly nonrenewable.

It has been said that solar power has an even greater potential than atomic power. According to Dr. Farrington Daniels, a world wide leader in the search for new energy sources, the volume of potential solar power is as much greater than the potential power in the atom, as atomic energy is greater than ox power.

CBS vs NBC on Color TV

The outlook for color Tv as viewed by two large national networks, CBS and NBC, are as different from each other as night and day. CBS, aside from one or two contractual commitments, has been seriously contemplating dropping all color programming from its schedule. NBC, on the other hand, sparked by RCA, has just appropriated $12,000,000 to go toward expansion of its present color Tv facilities.

In addition to the factors of high production costs for color and a limited audience, CBS's chief complaint is the poor quality "soft picture" that 39,000,000 black-and-white sets receive when a program goes out to 10,000 color receivers. NBC, not exactly mindless of costs but foreseeing greater color Tv set sales, claims that color transmission does not interfere with monochrome reception because of the compatibility of the color system they employ.

It may make an interesting race, with both entries running in opposite directions. NBC is now busy converting Chicago station WNBQ into the first all-color television station in the world. CBS, while questioning the value of color, will certainly be keeping an eye on RCA color Tv set sales. Chairman Sarnoff of RCA has predicted "more than a couple of hundred thousand" such sets to be sold in 1956.

New RCA Drive-In Equipment

A wide variety of drive-in theatre screens and functional lighting equipment, including screen towers which can be adjusted for any degree of tilt for any length of projection throw, is now being distributed nationally by RCA theatre supply dealers. The new line, manufactured by Signs, Inc., of Boston, Mass., and marketed under the name RCA Drive-In Showmanship Equipment, also includes moonlight towers, outdoor marquees, ramp indicators and other lighting equipment.

At the same time, RCA announced a Dyna-Heat in-car heater intended to extend the season for outdoor theatres so that the colder winter months will be included. Described as "small, compact, and lightweight for maximum ease of handling," the heater can be taken into the car and operated by the patron. The new heater comes in two types, 500- and 750-watts, and can operate on either 130-, 203-, or 230-volts.

Correction

In the article, "The Development of the Motion Picture Projector," in the March, 1955 issue of IP, it was stated that the patent number issued to C. F. Jenkins in 1895 for the first projection machine ever made was 586,953. We are indebted to Mr. Glenn E. Matthews of SMPTE and the Eastman Kodak Co. for the correct number of this patent, which is 536,569.

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DECADE OF FILM PROGRESS

(Continued from page 24)

The inability of dye-imbibition color prints to meet the high standards of image definition demanded by today's wide screens became obvious when CinemaScope entered the field. In the standard Technicolor process, misregistration of the three primary-color records (blueviolet, green, and red) must be guarded against at every stage of the process from operation of the 3-strip camera down to imbibition-printing of the release positives in the three reciprocal colors (lemon, magenta, and cyan). The process is quite complex, for a number of intermediate films, including duplicate negatives and printing matrices, are involved.

Better Prints Obtained

The use of dye-coupler films having "built-in" color greatly minimizes registration difficulties in production practice. There are no registration problems at all when master color positives are used for printing the duplicate color negatives from which the release positives are made. It is customary, however, to take every possible precaution against loss of color quality by printing three black-and-white separation positives from the original color negative. These positives are the masters from which dupe negatives in color are made; and the dupes are used in regular printers for producing the release prints in color.

The extremely good image definition of dye-coupler color prints is due not only to perfect registration of the three superposed reciprocal-color images, but also to the absence of "bleeding," or spreading, of the lemon, magenta and cyan dyes. The dyes are formed in the emulsion layers during processing, and they are insoluble compounds.

The inability of the old-style imbibition prints to give clear images when magnified on the screen may be attributed to registration imperfections and to the tendency of the printing dyes to spread in the gelatine coating of the positive stock. Another annoying factor was the inherent fuzziness of the chemically-treated relief images on the dye-imbibing matrix films—a blurriness which got progressively worse until the worn matrices were replaced with a fresh set for making additional prints.

The troubles which beset imbibition prints have been largely overcome by recent refinements in the process. There still remains a minor difficulty in the resolution of the green record (the magenta dye-image) which has made itself apparent because overall image definition of any color print is determined in great part by this particular image. All in all, modern Technicolor prints have attained a surprisingly high degree of perfection, and are preferred by many producers on account of their relatively low cost.

3-D and CinemaScope

Having just accustomed himself to the splicing and handling of triacetate safety film, the projectionist in 1952 stood at the threshold of even more startling developments in the product with which he daily creates illusions of sight and sound. For in 1952 the 2-strip method of stereoscopic projection *via* polarized light made its debut.

Stereoscopic, or 3-D, movies opened the gates to the ultimate in visual realism, but failed to enter in. Promoters played midwife to a difficult technical innovation, and the 3-dimensional child emerged stillborn. An almost total lack of familiarity with the basic principles of binocular viewing and stereoscopic reproduction on the part of cameramen, producers and film distributors spread confusion in projection rooms and disgusted the public.

Dead despite sporadic attempts to resurrect it, 3-D introduced stereophonic sound reproduction from multiple magnetic tracks. In its earliest form, a separate sound film carrying 3 or 4 magnetic tracks was run in step with electrically-interlocked projectors, a system employing two corresponding picture films in addition to the sound film. With three films running simultaneously in exact synchronism, a break in any one of them could easily unnerve the most intrepid projection crew.

In 1953 the anamorphic process

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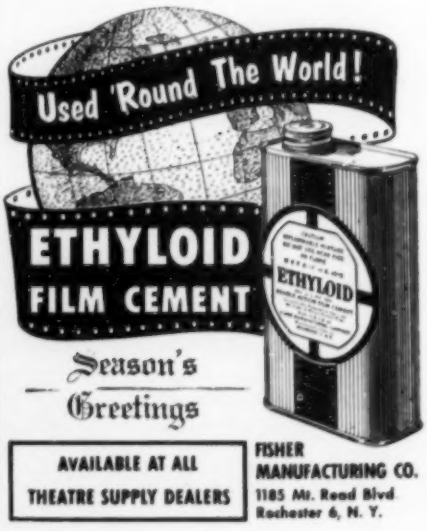

known by the Fox trade-name of CinemaScope came in, and 3-D gathered up its multiple 5000-foot reels and quietly departed.

CinemaScope transferred the magnetic sound tracks to the single picture film which carried anamorphically-compressed images. The new film confronted the projectionist with several novel problems. First, the iron-oxide sound tracks were applied to the base side of the film, requiring scraping of both sides to make splices. (As an alternative to scraping the base side of CinemaScope magnetic-track film, the tracks may be removed by applying film cement to them and wiping them off.)

Second, the specifications of the magnetic-track film included sprocket-hole dimensions appreciably smaller than the standard. Not only were special splicing blocks needed, but also new sprockets having smaller sprocket teeth.

Magnetic C'Scope Prints

Despite the tender care given these prints by projectionists, even going to the trouble of demagnetizing sprockets, idlers, and steel gate parts, magnetic disturbances are not always avoidable. In some cases these disturbances cause noise in the sound; in others partial erasure of the recorded sound occurs. Especially troublesome is the attenuation of the two tracks in the perforation margins.

The choice of smaller sprocket holes for magnetic-track prints was admittedly unfortunate. Not only is the useful life of the CinemaScope films themselves reduced, but also that of regular prints projected on machines equipped with the new narrow-tooth sprockets. The damage consists of cuts in the pulldown edges of the perforations well in from the corners.

It has been demonstrated conclusively that both CinemaScope and non-anamorphic widescreen pictures are more lifelike and dramatic when stereophonic sound reproduction is employed. The CinemaScope magnetic-track method was a commendable attempt to provide stereophonic sound without the surface-noise difficulties inherent in the multiple optical-track method. Single-channel sound is entirely satisfactory for conventional, 3:4-proportioned pictures; but the effect of single-source sound is unnatural in widescreen projection, and especially in CinemaScope, which has the highest aspect ratio of all.

The directional-sound process known as Perspecta produces a general stereophonic effect from a single standard optical track "cued" with subsonic signal tones. When the optical reproducing system consisting of soundheads, amplifiers, and speakers are of high quality, the reproduction of optical tracks by the Perspecta method gives good results.

[TO BE CONCLUDED]

65-mm Technicolor Facilities

The whole range of Technicolor laboratory facilities and services from developing of color negatives to motion picture release prints will soon be available for 65-mm films, it was announced by Herbert T. Kalmus, president of Technicolor Motion Picture Corp.

"Installation of 65-mm equipment has been started in response to producer requirements," Dr. Kalmus stated. "The Hollywood plant will be the first Technicolor company to have the 65-mm developing and processing equipment."

The new service is being added to present manufacturing of Technicolor release prints for Cinerama, CinemaScope, VistaVision, Superscope, and conventional type motion picture.

Kalmus said that from these large area 65-mm negatives it will be possible to make release prints in virtually any aspect ratio on 16-mm to 65-mm wide film.

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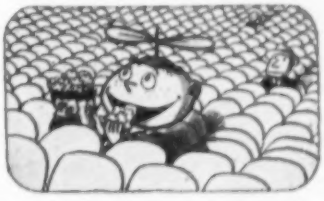

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Portable Cinerama Setup

A portable setup, to be used for Cinerama roadshows, may be ready by the end of 1955. Cinerama engineers, who have been working on the design of portable booths and screen equipment to be used in theatres, field houses, tents, and even open air, have now developed an overall system that will facilitate, among other things, the installation of wiring, electric power and ventilation.

The aim of the portable setup is to increase the number of outlets capable of handling Cinerama. Other developments announced by the company, are an improved printing process to insure image stability and faster lenses for cameras.

Film Exports Increase

Exports of motion picture films and equipment during the first half of 1955 totaled $22,237,794, a gain of more than 20% over the first half of 1954, when such exports were valued at $18,457,874. These figures were released by the U. S. Department of Commerce.

Exports of all types of motion picture equipment, including cameras, projectors, theatre and studio equipment, amounted to $7,627,563 during the first half of 1955 compared to $7,787,265 in the first half of 1954. The only notable increase was in the export of arclamps which totaled 1,597 units valued at $226,627 during the first half of 1955 compared to 477 units valued at $192,597 for the same period of 1954.

SMPTE Wide Screen Booklet

A compact booklet describing the several new methods of motion picture production and exhibition that came into use since 1952 has been published by the Society of Motion Picture and Television Engineers. The booklet offers a comprehensive outline of present day techniques and the ways in which these differ from the ones that became "standard" during the late 1920's. No attempt is made to evaluate the different systems.

IDEAL THEATRE PLANNED

(Continued from page 25)

"peripheral modulation," Smith stated, "Image modulation cannot be a fixed condition but one which varies according to the scene and action therein. The human eye sees a relatively small area with sharpness. Further, in terms of color there are rapid fall-offs to grey in peripheral or side areas of the human angle of vision." "Therefore," Smith continued, "at the extreme sides of the screen image, "It is proposed that a blend of light tone continue and constitute a sympathetic surround—a surround which is obtained from light values derived from the scene being projected and hence truly sympathetic to the natural human way of observing a scene."

To further increase realism, barrier walls will be erected behind each of the eight rows of seats of the sharply-sloping theatre so that the heads of other spectators will not be seen. In addition, double arm blocks and generous aisle space will add to the viewer's comfort.

Another of the unusual features of the dual theatre will be the small size of the audience (250) compared to the large size of each of the projected images (60 x 30 ft.), thus assuring that the picture will completely fill the field of view of the spectators. This is considered to be one of the prime requisites for creating a feeling of realism.

High-Fidelity Sound

As much as realism and participation are sought for visually, so will they also be the goals for the sound reproduction system in the ideal theatre. A 6-channel stereophonic sound system on separate film will be used. Smith defined "good sound as some-

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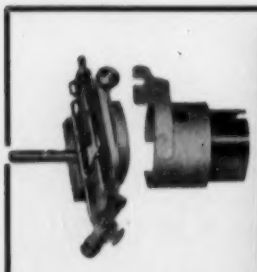

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thing so real that the audience is not 'mechanically' aware of it."

To avoid unwanted reverberations or echoes, the theatre will be designed acoustically dead, with facilities for introducing special effects into the sound channels when desired. Dr. Beranek notes: "Of primary consideration in the design of such a hall is the complete freedom from interfering noises that will arise from visitors circulating in the lobby, air-conditioning systems, and from the movie projectors themselves. Because of the desire of Mr. Schlanger to gain all possible light intensity on the movie screen, it has been decided to replace the usual plate glass window in the projection booth with a sound trap that will pass 100% of the light but will be effective in eliminating noise from the projectors.

"It has also been necessary to deaden the 'pews' in which the audience sits to reduce their own noise and to prevent undesirable reflections of sound from the loudspeakers back into the front part of the auditorium."

In concluding, Smith stated that the production of the orientation film will be related to the method of exhibition. Whereas commercial theatres cannot practically accomplish this, the Williamsburg project has a very unique opportunity in producing a single feature with story, filming, and editing all keyed toward exhibition in a specific theatre designed to exhibit only that feature.

Production of the orientation film is scheduled to begin within the next few months. Construction of the ideal theatres is already under way in Williamsburg, and it is expected that the project will be complete and operating in 1957.

PORTABLE ARCS FOR 16-MM

(Continued from page 20)

to the rectifier. Also included on the rectifier are an AC voltmeter and line-voltage adjustment taps.

The Xenon Arclamp

A new type of light source which has been developed for use on 16-mm projectors is the xenon-arc lamp. Fundamentally the xenon compact arc lamp is an electric arc in a confined xenon-gas medium between two closely spaced electrodes.

The first man to make a compact xenon-arc lamp appears to be Paul Schulz in Germany. In 1951 work was begun by the Hanovia Chemical and Manufacturing Co. of Newark, N. J., on the feasibility of using a xenon-arc lamp for the 16-mm projector used by the Navy.

Some features of the xenon arc are:

(1) A compact optical system can be used since the xenon-arc lamp is an enclosed bulb.

(2) The light from the arc can be pulsed so that no shutter is required on the projector. Power is consumed

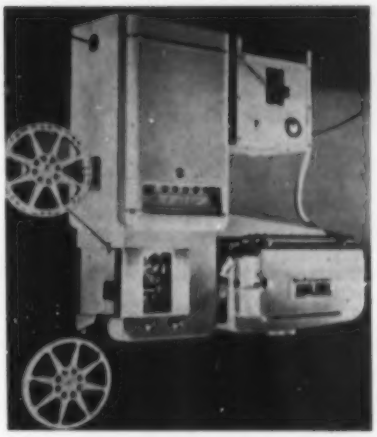

Fig. 4. 46-amp arclamp used with Kodak model 25.

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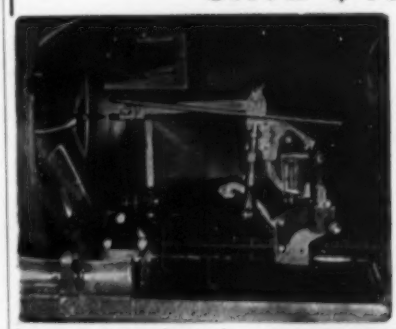

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by the arc only when the light is being used on the screen.

(3) The arc requires no more attention than an incandescent lamp and will operate for any length of reel.

To strike the arc automatically and obtain a pulsed light output a ballast and starter are required. The ballast package which is a separate unit consists of a striking and ballast transformer, peaking transformer, striking condenser, line contractor and high-voltage transformer for the pulse coil.

The starter components are the pulse transformer, capacitor and spark gap. When the lamphouse door is opened a line contactor in the ballast will be de-energized, thereby removing all high voltage.

The xenon lamp and striking circuit require 150 volts, 900 va at strike. After establishment of the arc the arc will burn at 30 volts and 30 amps, AC.

This lamp as used on the Navy AQ-2(1) projector is capable of projecting 2000 lumens on the screen with a center-to-side screen distribution of 75%.

RCA MAGNETIC TAPE SYSTEM

(Continued from page 18)

twice as much pictorial information must be carried as is required for just black-and-white television.

Specially designed circuits feed the video signals into the recording heads and carry the signals away during playback into monitors and transmitters. A constant speed transport mechanism regulates the tape flow. This is essential in carrying the tape at a uniform rate past the recording heads, since a variation of speed by as little as one part in 5-million will produce an appreciable jog in the image on the face of a 21-inch Tv picture tube. The model now at NBC operates at a speed of 20 feet per second and can accommodate a 15-minute Tv program on a 20-inch reel.

The tape itself is of a special plastic, a half-inch wide and one mil thick, and incorporates six separate channels on its surface. This total is needed to provide a channel for each of the three primary color signals of red, geeen and blue, for the high frequency signals, for the synchronizing signal that maintains the proper relationship between the colors, and for the audio signal carrying the sound accompanying the picture.

COLOR FILM REPRODUCTION

(Continued from page 12)

ing effects of excessively high levels of illumination, therefore, it is both possible and practical to duplicate the entire gamut of hues, including all the colors of the spectrum, by addi-

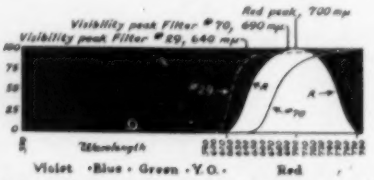

FIG. 9. Comparison of an ideal red filter with two commercial gelatin filters. The filter indicated by the broken line passes "high red," and is scarlet, rather than true red. In appearance it is much redder than ordinary red substances, such as red paint, however. The deep red filter indicated by the solid line is much redder than any object found in nature, and is excellent as a source of primary-red light.

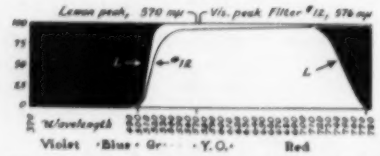

FIG. 10. An ideal lemon ("minus-blueviolet") filter compared with an excellent gelatin filter designed to pass green and red light while absorbing blueviolet.

tive combinations of the three primaries. Fig. 6 reveals the composition of every hue in the entire gamut arranged so that equal intervals along the scale represent approximately equal sensation-differences as regards the combined effect of hue and relative brightness. The thirty hues named and specified at the bottom of the chart are proposed standards.

As we said before, there are several good sources of primary lights for additive color-mixing and evaluation purposes, viz., narrow blueviolet, green, and red bands isolated from an actual spectrum produced by a spectroscope, fluorescent lamps, glow tubes, mercury-vapor lamps, and ordinary white lamps, fitted with glass or gelatin color filters.

Color filters are very convenient, although somewhat wasteful of light, and are satisfactory when they transmit only the desired wavelengths and absorb all the others. Filters are widely used in color cameras and in printing apparatus for making separation positives from color motion-picture negatives, and also for making color duplicate negatives from separation positives.

Figs. 7 to 12, inclusive, have been drawn from spectrograms of certain common color filters of good quality to show what their transmission characteristics are. The clear white areas reveal the characteristics of "ideal" filters having maximum permissible transmission-efficiency. The superposed solid and broken lines show the characteristics of commercially available gelatin filters costing about 50 cents per 2-inch square.

To make the purpose of the spectrograms clearer, let's look first at Fig. 8. It will be seen that the ideal primary-green filter (white area) transmits only a rather narrow band in the green region of the spectrum. This filter "peaks" at 530 mu, the wavelength of primary green. A good gelatin filter, denoted by No. 61, transmits a somewhat wider band including the yellow and orange regions of the spectrum and part of the blue. (Yellow is transmitted at about 25% intensity; and since yellow is a combi-

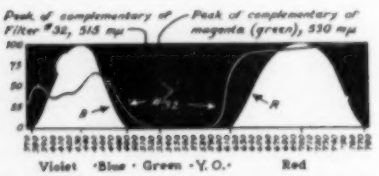

FIG. 11. Comparison of an ideal magenta ("minus-green") filter with one of the best commercial magenta gelatin filters. Perfect magenta dyes having high transmission efficiencies are non-existent; the dye used in this commercial filter, even though carmine-magenta in hue and transmitting too broad a band in the red, is nevertheless very useful in applications requiring the absorption of green light.

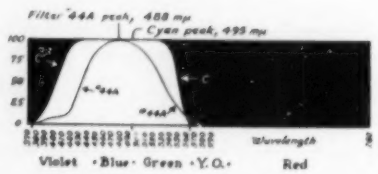

FIG. 12. An ideal cyan ("minus-red") filter compared with an available gelatin filter used for absorbing red light. While extremely serviceable, this commercial filter is definitely bluer than cyan.

nation of green and red, the No. 61 filter may be said to be too red-transmitting for many of the applications requiring primary-green light.) The No. 61 filter peaks at 525 mu, quite close to ideal primary green.

Figs. 7 to 9 give the characteristics of primary-color filters; Figs 10 to 12 those of reciprocal-color filters.

[TO BE CONTINUED]

Mrs. Brown refused to sink

"Keep rowing or I'll toss you all overboard!"

The threat came from a redhead in corset and bloomers, with a Colt .45 lashed to her waist. And as the lifeboat marked *S.S. Titanic* lurched into the waves, she rowed too, rowed until her hands bled.

Mrs. Margaret Tobin Brown had come a long way to take charge of that crowded lifeboat. Once penniless, she now had millions. Once semi-illiterate, she now knew five languages. Once spurned by Denver society, she now hobnobbed with nobility.

But, as she said, "You can't wear the social register for water wings." Her $60,000 chinchilla cloak covered three children; her other outer garments she had given to elderly women. She swore, threatened, sang grand opera, joked—and she kept her boatload of wretched survivors going till rescue came.

Asked how she'd done it, she replied, "Typical Brown luck. I'm unsinkable." But it wasn't luck. It was pluck. And Americans have always had plenty of that smiling, hardy courage. When you come to think of it, that's one reason why our country's Savings Bonds rank among the world's finest investments.

For 160 million determined Americans stand behind those Bonds.

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* * *

It's actually easy to save money—when you buy United States Series E Savings Bonds through the automatic Payroll Savings Plan where you work! You just sign an application at your pay office; after that your saving is done *for* you. And the Bonds you receive will pay you interest at the rate of 3% per year, compounded semiannually, for as long as 19 years and 8 months, if you wish! Sign up today! Or, if you're self-employed, invest in Bonds regularly where you bank.

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